

# AUTO ISSUE

JAN. 1962  
35 CENTS

ANNIVERSARY  
SPECIAL

# POPULAR MECHANICS

**'62 CAR SPECIFICATIONS—**  
Pocket-size color chart inside cover



**Drive—comparing the Ford 6,  
Chevy II and slim Plymouth**

**THOSE DREAMS DETROIT BUILT—**  
*Have they really changed your car?*

***How to save safely on auto insurance!***

**PLUS: Build a fun-to-use  
family fitness gym**

**Complete plans: Flying model air-car!**

**PLUS: Will automation take your job?**  
*by Secretary Goldberg*

**Miracles from a great new science**

**TEST YOUR QUICK-WIT QUOTIENT!**



**An engineer  
analyzes the '62s**



*sure-firing*  
**you get A**ction** with**



## **AC Spark Plugs' self-cleaning A**ction** promotes fast winter starts in All Cars**



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AC SPARK PLUG  THE ELECTRONICS DIVISION OF GENERAL MOTORS

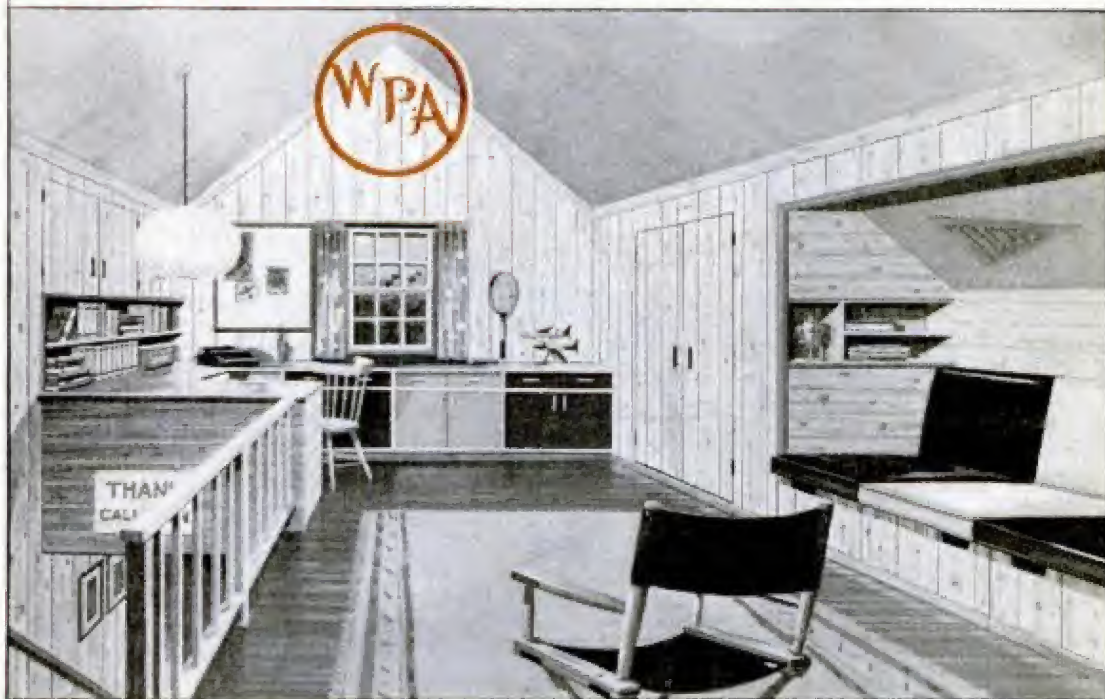
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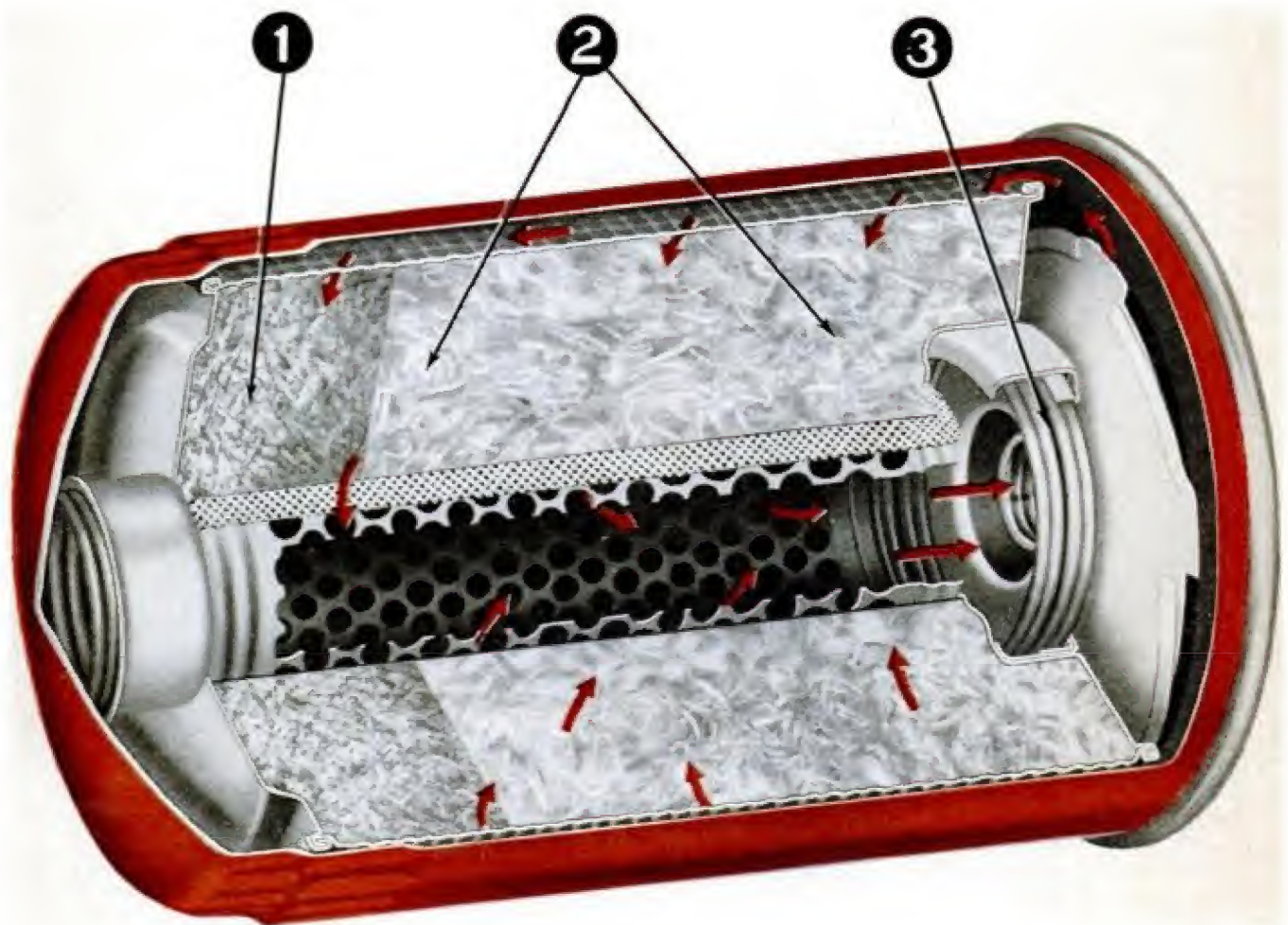
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The density of materials, rate of oil flow, and particle retention are precisely controlled to give the Rotunda Oil Filter double the useful life of many surface-type filters. The result is a cleaner engine, more satisfactory performance. Red arrows in illustration show precise path of oil flow through filter.



# OIL FILTERS

## and TWICE the filter life!

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**2** Filter materials used in Rotunda filters offer correct porosity to assure proper oil flow with maximum filtering protection for the engine. In some high-density, stuffing-type filters, the filtering materials are so tightly compacted that they block the oil flow and force the oil directly back through the relief valve.

**3** The Rotunda filter has a spring-loaded, positive-action relief valve that is located at the oil entrance end of the filter. If the filter ever becomes plugged because of extended usage, the relief valve will open to provide a full supply of oil to the engine for proper lubrication.

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And...when you order Rotunda Oil Filters, ask for Rotunda Shock Absorbers, too!

---

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PRODUCTS OF  MOTOR COMPANY

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**LJ54-RY2-LX2L**



# POPULAR MECHANICS®

JANUARY 1962  
VOL. 117 NO. 1



INTERNATIONAL EDITIONS • SPANISH: Mexico-Caribbean, Southern Hemisphere • FRENCH •

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## Next Month . . .

You'll see a handsome, roomy vacation home you can build in your basement this winter and assemble on the site next spring. You'll meet some bizarre weapons the U.S. has developed for the little wars in the Near East. You'll learn how an expert shops for the right portable electric drill. And you'll find attractive designs for clean-line contemporary furniture you can make from metal.

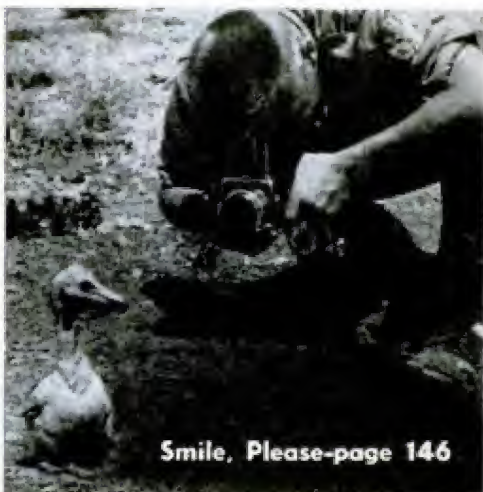
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- ❸ The sturdy, easy-riding Mono-Plate rear springs were made possible by breakthroughs in metallurgy and manufacturing. They eliminate the friction and squeaks of multi-leaf springs.
- ❹ From the 25.5-cu.-ft. trunk right on, space is used to your advantage. The Chevy II wheelbase is 110"; its overall length, 183" (187.4" in wagons); its weight, about 2,500 pounds. There are eleven models, including a convertible, sedans, a coupe and wagons. Without unnecessary frills or floss, they are practical, durable and (don't you agree?) nice to look at. More facts? See your dealer. . . . Chevrolet Division of General Motors, Detroit 2, Mich.

*new Chevy II*





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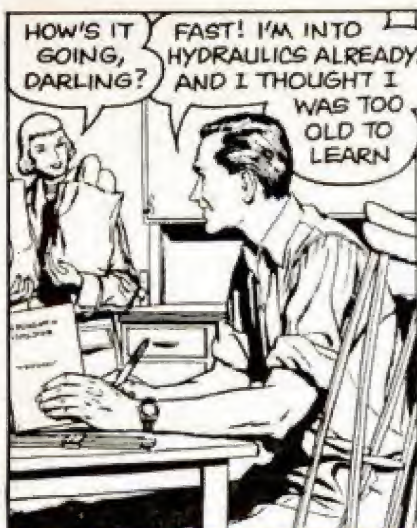


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5

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6 ONE MONTH LATER...

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I'M READY NOW, MR. WALSH



7 THEY GAVE ME SOME SIMPLE ASSIGNMENTS... AND I SURE SURPRISED THEM!

SAY, WHERE DID YOU LEARN ABOUT PUMPS?

SAME PLACE YOU DID, JOE... I. C. S.



9 THAT EVENING, JANE AND I WENT HOUSE HUNTING

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# Over the editor's desk

## Dynamite and Bread

I was much interested in the reader comments about the 60-year age of *Popular Mechanics*. In 1902 I was a 15-year-old teamster in Empire, Col., hauling dynamite and bread from Georgetown to the site of the Moffat Tunnel just being started. I subscribed to PM, which was then more like a tabloid, and jumped at your offer of a motorcycle for a certain number of subscriptions. Sorry to say I did not win the bike—nobody in them hills had any money. But since then, I've missed few copies of PM. Congratulations on your first 60 years—and many more of them. Portland, Ore.

TRUMAN NORTHUP

Here's hoping the second sixty brings us as many loyal friends as the first.

## Big Vibrators?

Read your article *Engine with Built-in Wings* (Sept. PM). In my opinion you have been "sucked in." I contend that these so-called "uni-directional" machines are nothing more than big vibrators and are completely worthless . . . Southfield, Mich.

WALTER E. RUNKEL

Inventor Norman Dean points out that his *Dean System Space Drive* is neither a vibrator nor a ratchet device, frictional or otherwise. Mr. Dean notes that U. S. Patent 2,886,976 issued on his system explains why, makes the system demonstrably clear, and is well understood by industry and others in the trade.

## Kentucky Invitation

Here's a pontoon boat I constructed from your March 1959 PM plans. A few extras from my own planning are: lantern brackets for night fishing, rubber bumpers to protect the barrels at the boat dock, and removable top guard rails to ease the fishing.



It is built so a canopy can be added later.

My family and friends have certainly enjoyed our many boat rides and fishing trips with this craft this summer. You have my special invitation to take a cruise if you're down near the Ken Lake boat dock at Kentucky Lake.

Nortonville, Ky.

JAMES E. FULLER

*Thanks for the generous invite, Jim. When would you say Kentucky fish are the hungriest?*

## 2416 Pieces of Wood

Hope you can use my latest workshop projects for your magazine. These inlaid card tables were made by cutting, fitting and gluing veneer on plywood. The table



on the left contains over 1100 pieces of 67 different kinds of wood while the one on the right has 2416 pieces of 85 kinds of wood.

Ortley, S. D.

HAROLD J. BUTLER

*Wish we had the skill and patience needed to produce such elegant craftsmanship, Harold.*

## Iron-Curtain Raiser

There is a fine violinist who emigrated to Israel about one year ago from Rumania, where he was Concertmaster of the Radio Orchestra and a musician of much prestige. He was once given a copy of your magazine and he became a most avid reader. Being gifted with his hands he also proved himself gifted at putting into practice what he read.

The difficulty was in getting the magazine. He used to go into the American Embassy library whenever he had a few minutes, to read an issue. After a few months of this, he was suddenly accosted leaving the Embassy and thrown into jail. For six months his wife and children did not know where he was and he did not know what he was charged with. Then, suddenly, he was released, on condition that he speak to no one about his imprisonment and cease all "contact" with the West. Convinced he could no longer live under

(Continued to page 12)





## *The most RUN for your money!*

This black Phantom is the world's first 100 hp outboard motor. This is the new Merc 1000, loafin' along at three-quarters throttle.

This is a man's motor . . . but it's easy-handling enough for a beginner.

It's all new, from prop to 90-cubic-inch powerhead. It was tested over more than one million miles at Lake X, Florida, before the O.K. was given for production.

What can you do with this kind of outboard power?

It's made for larger, deeper, heavier, seaworthy boats. You can pull more skiers. Go farther faster. Ease back on the single-lever throttle and plane along. Get half again the distance on a tank of fuel.

Any place you use it, any way you use it, this new Merc 1000 Phantom will give you the *most* RUN for your money!

***Now is a good time to see the Merc family***

***of family outboards: 6-, 9.8-, 25-, 45-, 50-, 70-, 85-, and 100-horsepower motors!***

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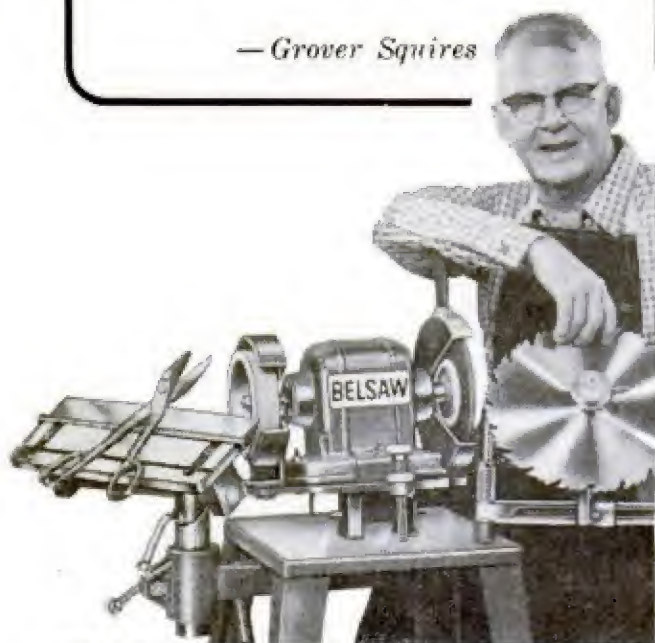
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such oppression, he made application to leave Rumania for Israel. At that moment, his job was taken away and he and his family were close to poverty during those last months in Rumania.

What is remarkable to me is that today this man waits anxiously for each copy of *Popular Mechanics* to appear on the newsstand.

Tel-Aviv, Israel

RUTH LEVENSON

*We are indeed grateful that such a devoted reader is now safely in a land where the mind is free to inquire and the hands are free to create. Give him our best wishes.*

## Turning-Circle Champ?

This worked-over 1942 Jeep is very handy for my work as a Forest Warden. It will turn within a 19-foot circle. I rebuilt a front axle and installed it in the rear, then connected the rear steering mechanism



with the front so that the rear wheels turn left when the front wheels are turned right. Now, in following narrow trails or driving between stumps, no thought need be given the rear. But I can't park too close to the curb.

Castle Rock, Wash.

AMON BEBE

## Interesting Requests

Supplementing our last month's list of interesting reader requests are two new beauties: One man wants plans for a circus acrobat's mouthpiece and suspension bar for swinging; another wants plans for a 20-25-foot Chinese junk. It seems his wife likes to sail, but only if the boat is perpendicular to the surface of the water.

And speaking of projects, if you plan to build the vacuum-forming machine shown in our December issue, add a sponge rubber gasket to the rabbeted edge of the lower half of the frame which holds the plastic sheet. This improvement creates a more effective seal at this point.

By the way, we'd welcome seeing photos of vacuum formed projects any of you create with this interesting little machine.

*The Editors*

POPULAR MECHANICS



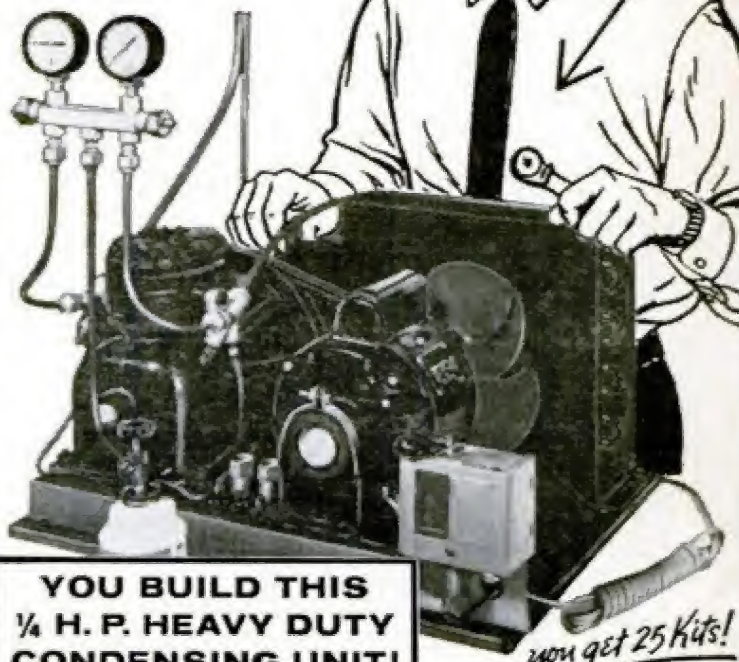
# How to 'take charge' of a highly-paid job

in

## AIR CONDITIONING & REFRIGERATION

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CONDENSING UNIT!**

*you get 25 Kits!*

### Many CTI graduates go in business



It is relatively easy to start a repair business in the Air Conditioning and Refrigeration field. Armed with up-to-date knowledge, seasoned with skill acquired through practice on kits, and equipped with tools and gauges, many graduates start out on their own. Some expand into retail stores. Others have contracts to service taverns, restaurants, food stores and commercial buildings. The more resourceful become contractors. Conditions for success are excellent.

### Many students earn cash as they train

The average CTI student is eager to put his skill to profitable work, on a part-time basis. Though most students prefer to tie up with local dealers and repair establishments, a surprising number are independents. The extra cash helps meet training cost. Often there's enough to bank, or invest in more equipment.



### Letters prove efficiency of training



"I have a business of my own servicing domestic and commercial refrigerators."—*Paul Humphrey, Colo.* "I made \$1,000 while training, and am now a refrigeration man for a dairy."—*Giles Minton, N. C.* "I opened a little shop and am swamped with work."—*Charles Corley, Kan.* "Doing service work on a part-time basis the past 10 months, I earned \$2,400. Have a nice business."—*Renos Johnson, Ind.* "My firm advanced me to field superintendent."—*Milburn Dougan, Ark.* You can do as well as these graduates!

An exclusive feature of CTI training is that you get parts to build a 1/4 h.p. commercial-type condensing unit (above). You also receive mechanic's tools and gauges (right). After unit is assembled, you can build an air conditioner, freezer, refrigerator or milk cooler. Only CTI sends working kits.



### Learn by practicing—Get valuable experience

The modern way to train is to gain skill and experience *with* knowledge—not *after* you graduate. From CTI's simple picture-lessons, you master elemental theory. From experiments and building with kits, you develop skill. In other words, you learn by practicing, pick up solid experience much like on the job. That's the interesting, relaxing way to train after a day's work on your present job. CTI training is exciting!

### Send for fact-filled booklets—Mail coupon now

Exactly what are your opportunities in Air Conditioning and Refrigeration? How does CTI train men for success? Get detailed, accurate answers to these and many more questions by filling out and mailing the coupon below. No obligation. —Commercial Trades Institute, Chicago 26, Ill.

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## Sidelights on aviation

**Vapor trails** may soon vanish. These contrails (for condensation trails) are caused by the condensation of hot engine gases in the extreme cold of high altitude. They are the amateur sky-watcher's favorite clue to high-flying aircraft.

Now the Air Force claims that it can reduce the size of the water-vapor particles that come from the burning engine fuel by mixing them with tiny dustlike particles in the engine exhaust. The result is a vapor trail of droplets too small to be seen from the ground.

**Babe Ruth and Charles Lindbergh** made the headlines in 1927 when the Babe hit 60 home runs and Lindbergh flew nonstop New York to Paris in 33½ hours.

Last year was a bad year for both. The Babe's record for number of homers in a complete season was broken by Roger Maris. And Lindbergh's record, while it had been broken before, was demolished beyond recognition.

An Air Force B-58 Hustler, named "The

Spirit of St. Louis III," streaked across the Atlantic over Lindbergh's old route in 3 hours and 20 minutes—one-tenth the time taken by the Lone Eagle 34 years before.

**Riding on air** is one solution put forward for safety in air crashes.

An aircraft manufacturer has designed a passenger seat that, except for nylon shoulder straps and seat belts, is almost all air cushion. At the moment of impact, the seat bottom compresses under the load and balloons out, distributing the load forces. Even if the passenger jack-knives over his seat belt, he would not hurt his head because the seat back in front is also an air cushion. The air-bag seat is designed to withstand decelerations up to 50 Gs.

**Neither railroad, road nor river** could stop Denver's Stapleton Airport from its appointed rendezvous with the jet age.

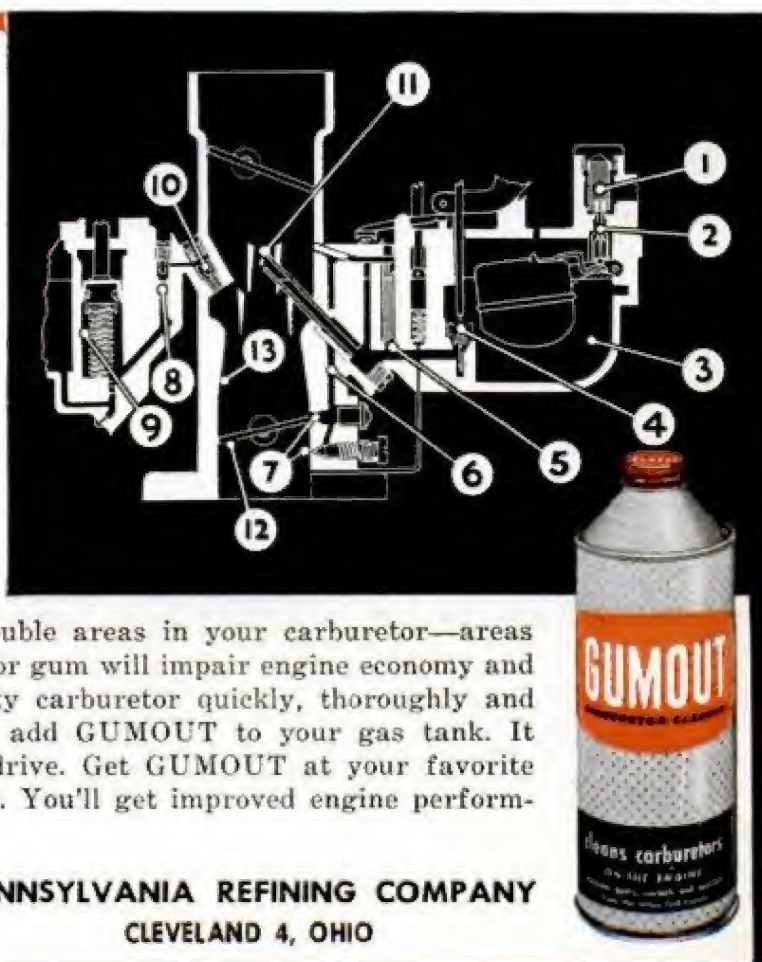
It had to extend a runway to 11,500 feet to accommodate the fast-landing big jets, but the mainline of a railroad, a major highway and the branch of a river were in the way. The airport is now extending the runway over all three obstructions by building underpasses for each.

*Kevin V. Brown*

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# "Wouldn't some of my high school teachers be surprised if they could see me now"



"I just managed to squeak through my courses in math and science, and a week after finishing high school I went to work on a production line. It didn't take me long to realize I hadn't much future doing that. Now I'm an Electronic Technician. That really would surprise some of the folks who knew me when!"

"How did I do it? Well, I had to earn more money. I had gotten married and pretty soon there were three of us. Then, along came Automation. Push buttons began replacing people in the plant and my future prospects were getting shaky.

"One day I came across an NRI ad. It talked about the Electronics Age . . . that 4 to 7 Technicians were needed *now* for every graduate engineer . . . and how easy it is to learn Electronics at home the NRI 'learn-by-practice' way.

"So I picked out the course I wanted from the free catalog NRI sent me and got started. Pretty soon I was performing home-lab experiments with the equipment NRI sends. I was actually building Electronic instruments myself! There were some rough spots, but with the personal help I got from NRI instructors I even handled the math okay. Now, instead of being replaced by Automation I've had a big jump in pay. I've been reclassified an Electronic Technician and operate the equipment that once threatened my job.

"If that isn't proof NRI can improve a man, I don't know what is. If anyone asks me (and they have) if he should take NRI training, I tell him to hop to it and stop wasting time."



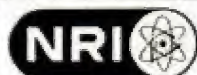
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By Jim Whipple



## **Needed: Better Safety Belts, Safer Stop Lights.**

## **Transistorized Ignition, More Alternators in '63**

Safety is very much in the minds of both automakers and motorists this year. There's a growing trend toward installation and use of seat belts, thanks to manufacturers' built-in front anchor points.

Anchors for easy installation of rear belts are needed on many cars and will come soon, but nobody has solved the problem of keeping a squirming five-year-old strapped in during the 200-mile trip to Grandma's.

Sooner or later, the question of lap belts, such as are installed in U.S. cars, versus the combination cross-chest-and-lap belt will arise. The latter installation is increasing in popularity on European cars such as Volvo.

The reason is that, although lap belts keep you in the car, they do not prevent the upper part of your body from jackknifing forward and hitting something. Recently, a manufacturer conducted an interesting test in which a car with a lap-belted dummy behind the wheel was crashed into a solid wall at 30 m.p.h.

The belt held, but the upper part of the dummy, weighted to approximate the average male, catapulted into the steering wheel, twisting it around the column like a pretzel. Witnessing this won our vote for shoulder-plus-lap belting in a matter of seconds.

Safety in signaling is due for a boost soon when the Automotive Manufacturer's Assn. adopts a dual intensity stop light for all cars. It's basically a two-filament stop-light bulb which increases the intensity of the stop-lamp signals two to four times during daylight hours when headlamps are not in use. At night brightness will be lowered so that stop-lamp glare won't shock following drivers into panic stops.

Other good ideas on signal lamps may well be copied from European cars now adopting amber lenses for turn signals, red for tail and stop. These can be combined into a single lens and lamp unit that's less costly than the multiple lamps that now flash yuletide greetings across the trunks of some U.S. cars.

Lamps like these might eliminate some of the hundreds of daily "end-to-end" crashes on metropolitan expressways.

After a year or so of limited activity, English Ford is getting back into the game with its Anglia and Consul, to be marketed by 500 Lincoln-Mercury dealers.

Model lineup will include the recently introduced (in England) Anglia station wagon (Ford's answer to the Hillman Husky) and the new Consul "315 Classic," which are sleekly-styled four-cylinder sedans and hardtops with disk brakes.

Volkswagen has been busily saying that "We have no plans to import the new VW 1500," while just across the border, VW of Canada says that they'll have 'em by spring.

From a "usually reliable source," however, we hear that they'll be in U.S. salesrooms by summer. P.O.E. price of the VW 1500 sedan is pegged at \$2295 (so says our source), a full \$700 above the 1962 Volkswagen. This could introduce something new in U.S. auto marketing, the technique of downtrading.

It might work like this: You go into a VW showroom, examine the VW 1500, gasp at the price (and waiting list), then the salesman walks you over to the familiar Beetle and opens with, "Just look at how much car you can get for \$700 less!" So, stunned at the prospect of saving so much, you buy a Beetle, which is what the Volks boys had in mind all along.

In spite of premature talk of alternators throughout the industry on '62 models—only Chrysler Corporation has them across the board. Word from a major electronics firm suggests that Ford Motor Co. and American Motors will drop conventional d.c. generators and switch to alternators on their '63s.

Another electronic advance, transistorized ignition, is in the works for more than one '63 model. TI is the system in which transistors take over the switching of the 300-volt primary current into the coil, eliminating the condenser and using breaker points to trigger the transistor with a mere 12 volts. GM's Delco-Remy Division has just announced availability of a complete system.

PM has a conversion kit under test and will report on its performance in an early issue.

★ ★ ★

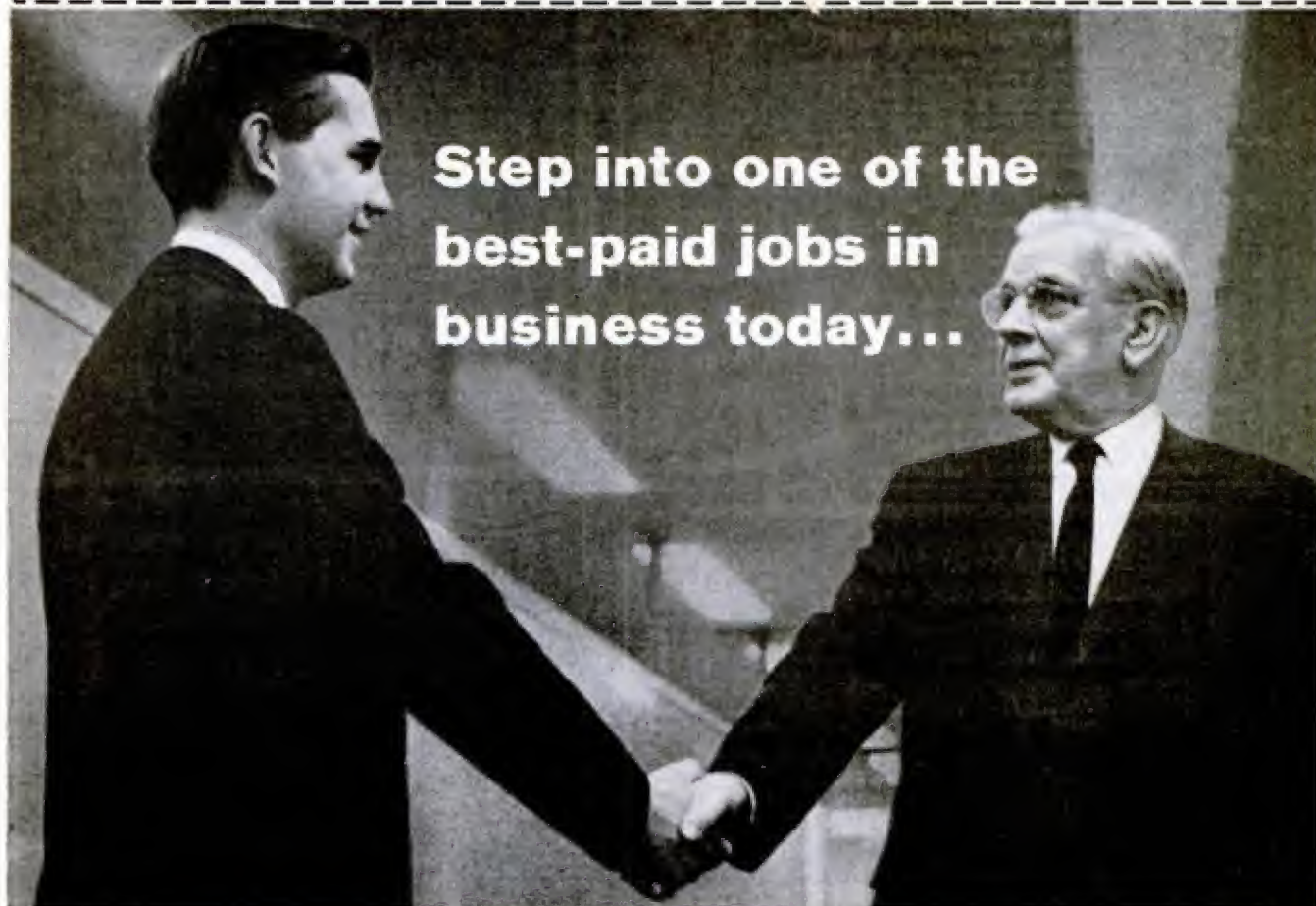


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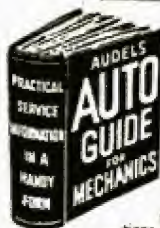
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## Items from all outdoors

Next time your fishing partner boasts of his prowess with a spinning rod, here's a good wet blanket to use on him: The new world record in one-handed spinning, set last fall at the International Casting Federation games in Oslo, Norway, is **291 feet!** That's with a  $\frac{3}{8}$ -ounce weight, and not with specialized distance tackle. The winner used familiar sporting gear; a  $7\frac{1}{2}$ -foot Conolon Rod, a Mitchell spinning reel, and two-pound-test Gladding Platyl monofilament line. Try that in your back yard when you get impatient for the season to open.

✓ ✓ ✓

A new outboard motor hits the market this year, but with a familiar name and a familiar type of powerhead. It's built by Homelite, the chain-saw manufacturer, and is a four-cylinder, *four-cycle* kicker that develops 55 horsepower at 5500 r.p.m. (Most two-cycle outboards are hp.-rated at 4200 r.p.m.) The new motor will revive the old argument about whether the four-cycle engine's fuel economy offsets its greater weight. For example, the 55-horse Homelite weighs 227 pounds; a 50-horse Mercury outboard weighs about 140. Portable four-cycle engines also need an occasional oil change and can't be laid down just any way or you'll spill the oil, but these are small inconveniences.

The offsetting economy claims are impressive: "It doubles your miles per dollar at full speed... even more at cruising speed." No exact fuel consumption figures are available at this writing, but if it cuts gas and oil costs in half through the usual speed range, that factor will be a big selling point, especially to long-cruise boating fans. The price is \$960 f.o.b. Greer, S. C.

✓ ✓ ✓

Survival kits of one kind or another are cropping up all over, and getting smaller every time. One of the newest and smallest is a packed pocket-sized model being made by Johnson Associates, Box 1516, Milwaukee, Wis. The little kit is about four by six inches in size, about an inch thick, but holds 20 survival items from fish hooks to burn ointment to a knife and a compass, plus a 16-page first aid and survival booklet. It's intended for sale in retail stores for \$2.49 in a plastic box; \$3.98 with a leather case; \$4.98 with a deluxe case in a gift carton.

*Dick Kichpatrick*

POPULAR MECHANICS

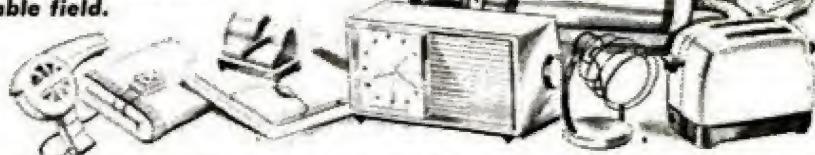


# Profits That Lie Hidden in America's Mountain of Broken Electrical Appliances

By J. M. Smith President, National Radio Institute



*And I mean profits for you — no matter who you are, where you live, or what you are doing now. Do you realize that there are over 400 million electrical appliances in the homes of America today? So it's no wonder that men who know how to service them properly are making \$3 to \$5 an hour — in spare time or full time! I'd like to send you a Free Book telling how you can quickly and easily get into this profitable field.*



**T**HE COMING OF THE AUTO created a multi-million dollar service industry, the auto repair business. Now the same thing is happening in the electrical appliance field. But with this important difference: anybody with a few simple tools can get started in appliance repair work. No big investment or expensive equipment is needed.

The appliance repair business is booming — because the sale of appliances is booming. One thing naturally follows the other. In addition to the 400,000,000 appliances *already* sold, this year alone will see sales of 76 million *new* appliances. For example, 4,750,000 new coffee makers, almost 2,000,000 new room air conditioners, 1,425,000 new clothes dryers. A nice steady income awaits the man who can service appliances like these. And I want to tell you why that man can be *you* — even if you don't know a volt from an ampere now.

## A Few Examples of What I Mean

Now here's a report from Earl Reid, of Thompson, Ohio: "In one month I took in approximately \$648 of which \$510 was clear. I work only part time." And, to take a big jump out to California, here's one from

J. G. Stinson, of Long Beach: "I have opened up a small repair shop. At present I am operating the shop on a spare time basis — but the way business is growing it will be a very short time before I will devote my full time to it."

Don't worry about how little you may now know about repair work. What John D. Pettis, of Bradley, Illinois wrote to me is this: "I had practically no knowledge of any kind of repair work. Now I am busy almost all my spare time and my day off — and have more and more repair work coming in all along. I have my shop in my basement."

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If you'd like to get started in this fascinating, profitable, rapidly growing field — let us give you the home training you need. Here's an excellent opportunity to build up "a business of your own" without big investment — open up an appliance repair shop, become independent. Or you may prefer to keep your present job, turn your spare time into extra money.

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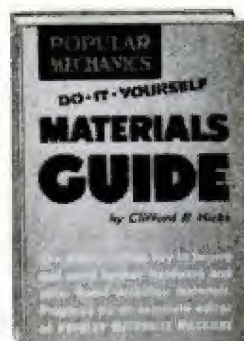
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# Science overseas

By William Kreh

Hunger causes traffic accidents. British scientists who investigated habits of long-distance truck drivers found that speed of reaction and ability to concentrate are drastically affected by a craving for food.

Their advice to drivers: Don't eat a heavy meal before starting a trip, since this induces drowsiness, but do stop for short light snacks and take vitamin A and C tablets for between-snack support.



Glaciers are grown in northern Pakistan. The technique, used successfully in the past, is being employed by the villagers of Bunji to solve a water shortage.

They dig a deep pit on a nearby mountain, then relay teams carry cubes of ice from a nearby glacier and bury them, along with special chemicals and herbs, in the pit. The method of preparation, which deters melting, is a secret tradition.

If the glacier takes root, under care of the icy-thumbbed villagers, it will provide them with an ever-increasing supply of water for their crops.



Glue, not sutures, is being used to close wounds on some hospital patients in Tokyo. A group of 11 surgeons, directed by Dr. Seiji Kimoto, tested the glue—a synthetic resin adhesive normally used in electrical work—on dogs and rabbits; they then used it to close cuts on the skin, veins, windpipes and intestines of human beings. It sets in minutes.

The glue can be applied on wet surfaces, is harmless to human organs, is easy to sterilize and will not deteriorate at normal body temperatures. It is absorbed into the body safely within a few weeks.



A shoelace is saving water in Southern Rhodesia. It's part of a device which limits evaporation from reservoirs and lakes. A gallon cannister, mounted in a floating drum, is filled with a mixture of alcohol and paraffin. Dripped slowly on the surface of the lake, this mixture forms a skin that cuts evaporation.

The valve originally used to release the mixture kept getting clogged. The shoelace, acting as a wick, now spreads the skin smoothly.



An abandoned communications cable running between Hawaii and mainland U.S. will help warn Islanders that a tsunami wave (the type of wave that killed some 90 people on Hilo two years ago) is on its way.

The 4000-mile-long cable will be hoisted and pressure gauges added. Then it will be lowered in several hundred feet of water. The gauges will measure height of the waves by deep-sea changes in pressure. The information will be sent back to the Islands over the cable.



A gas-finding dog has come to the aid of New Zealand technologists who, after using all the modern equipment they could lay their hands on, could not locate leaks in the gas pipelines. This is a big problem, for 20 percent of gas fails to reach consumers.

The dog and its handler (who gets paid \$4 an hour) patrol the pipelines from 2 to 6 a.m. The dog sniffs along at about five-eighths of a mile an hour.



Two Americans, Sam Collins and Emerson Kailey, have a concession to churn the sea bottom along the Southwest African coast for diamonds.

They will search the sea bed at depths up to 100 feet from the low-water mark. They hope to raise diamonds, using this technique:

Two rubber hose-pipes will be lowered to the sea bed from a tug and barge. When pipes fill with water, air jets at the bottom of each will start pumping air into the topsoil. As the soil is disturbed it will whirl about and move up the pipe.

The mixture of air and soil inside the pipe will greatly reduce internal pressure with the result that the outside pressure of the ocean will force the soil (and maybe diamonds) to the top where sorting will take place on deck.



An eight-mile hole is scheduled to be bored into the earth by Soviet scientists, using a new kind of diamond drill. The hole is calculated to penetrate temperatures of about 350 degrees F. The Russians don't expect to find intact oil at such depths, but deposits may be tapped on the way down.



Weather story. The U.S. Weather Bureau sent a radio transmitter up in a balloon that was supposed to burst 16 miles high and parachute its instruments back to Earth.

The transmitter landed recently on the roof of a postal worker's home in Karachi, Pakistan—two years later, and a hemisphere away.



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POPULAR MECHANICS



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## Make \$5 to \$10 Per Call IMMEDIATELY

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### WHAT IS THE AMAZING NEW SYMTRONIC TRAINING METHOD?

Symtronic is a dynamic new concept based on the known fact that only a certain number of things can go wrong with any given set. For the first time these troubles, and their causes, have been isolated into three main groups. Through a comprehensive, but easily understood crossindexing system it's now possible to pinpoint the trouble in one of the 3 groups in a matter of seconds! What previously required long schooling is now available to you immediately through the amazing Symtronic System. Our Free Sample Lesson shows how the Symtronic Method will work on your own set, or a friend's. Write for it today!

### CUTS STUDY TIME EXPENSE

You want to get started servicing TV sets, not building them! So why spend long months studying under old fashioned, outdated methods... learning things you'll never use? Why buy lots of equipment to practice with when you don't need it? With the Symtronic System the COMPLICATED TECHNICAL THEORY IS ALREADY TAKEN CARE OF BY OUR OWN SCIENTISTS! There is nothing more you need in this line. What we give you is practical, down-to-earth know-how based on our many years of solid, scientific experience! Our revolutionary Symtronic methods let you compete immediately with servicemen who have had years of experience!

### COMPLETE SYMTRONIC BUSINESS PLAN PROVIDES "BLUEPRINT TO SUCCESS"

To make our training program the most practical available, we also offer a complete Business Plan developed by leading advertising and business consultants. Step-by-step, you learn how to get business, how to operate from your home, how to charge, how to keep records, etc. — a complete "Blueprint to Success" that explains fully how to start, conduct, and ex-

### CASH IN ON THIS BIG PROFIT BIG FUTURE INDUSTRY!

TV servicing is a multi-million dollar industry and it's growing like wildfire! To keep pace, thousands of qualified Servicemen are urgently needed each year. The pay is big and there's no limit to your future success. Television is here to stay! In this field, too, you get paid for what you accomplish, not how long you work. \$5 to \$10 per call is the usual service charge... even though the job may take only a few minutes! Add to this the almost 100% profit on tubes and parts and you can easily see how Symtronic can put you into the big money practically overnight!

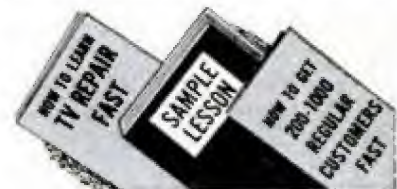
### SYMTRONIC PUTS YOU IN YOUR OWN BUSINESS NOW!

Imagine — with our amazing training method you know everything needed to handle any make of TV set, within one short week! And without buying any expensive tools or equipment. You learn at home — spare time. A few evenings of fascinating reading is all it takes. This is fact... not fiction. In just 7 days or less you will have sufficient knowledge and ability, and confidence in yourself, to make from \$5 to \$10 per service call — earn \$150 a week, working out of your home! Here, unquestionably, is your chance of a lifetime to get into the booming TV business... to enjoy the freedom and security that comes with a successful business of your own!

pand your own TV Service Business. In short, we not only offer the most streamlined, effective TV training available but a tested and proved Business Plan that eliminates all guesswork. Here, surely, is a "Business Package" that may easily bring you all the good things you desire... a practical education with a lifetime of value!



### Get these 3 valuable pieces ABSOLUTELY FREE!!!



1. "HOW TO LEARN TV REPAIR FAST (overnight)". A real eye-opener that reveals how the amazing Symtronic method puts you in this big-pay field right now!

2. AMAZING SAMPLE LESSON proves how the Symtronic method really works. Convinces yourself by repairing your set — or a friend's — the very first day!

3. "HOW TO GET 200-1000 REGULAR CUSTOMERS FAST (less than 1 week)". See the secret workings of the "Business-in-a-Package" mail plan that does all your selling for you!

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TV Servicing Systems, Dept. H-171  
1038 S. La Brea Avenue  
Los Angeles 19, California

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Corvette	Pontiac
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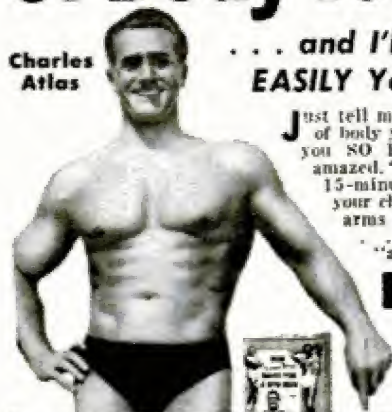
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... and I'll Show You How EASILY You Can Have It!

Just tell me, in coupon below, the kind of body you want—and I'll give it to you SO FAST your friends will be amazed. "Dynamic Tension," my easy, 15-minute-a-day method, will make your chest and shoulders bulge... arms and legs surge with power... your whole body feel "alive!"

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Dear Charles Atlas: Here's the Kind of Body I want:

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| <input type="checkbox"/> More weight—Solid—<br>in the Right Places | <input type="checkbox"/> Powerful Arms, Legs, Grip |
| <input type="checkbox"/> Broader Chest, Shoulders                  | <input type="checkbox"/> Slimmer Waist, Hips       |
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Send me absolutely FREE a copy of your famous book showing how "Dynamic Tension" can make me a new man—32 pages, crammed with photographs, answers to vital questions, and valuable advice. No obligation.

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## Science bulletins

The octopus does not crush open a few shelled mollusks, such as abalone, when he wants to dine; he bores into their shells with radula inside the suction cups of his tentacles. Researchers at Scripps Institution of Oceanography have found he then injects a venom that causes victims to relax muscles keeping shells closed.

Something in your eye? No wonder. National Aeronautics and Space Administration scientists say 10,000 tons of dust rain down on Earth every day.

They base this figure on measurements of interplanetary dust particles, made in Earth's vicinity, from U.S. and U.S.S.R. rockets, satellites and space probes.

The great Asian flu epidemic of 1957 may have spread from a pig, duck or chicken in a Chinese barnyard.

Dr. A. F. Rasmussen of the University of California reports, after a swing through Southeast Asia, that the Asian influenza virus and at least four animal viruses he studied overseas are closely related.

Fifteen-year-old Bill Vaughan of Arlington, Va., has made one of the most unusual and valuable finds ever made by a skin diver of any age.

Scuba-diving with two companions in Devil's Den Springs, near Ocala, Fla., in July, he found some bones buried in silt 45 feet beneath the surface.

The bones now lie in the Smithsonian Institution for they are the only known remains of the ancient Florida "shortfaced bear" which may have lived 1,000,000 years ago. They will be studied by scholars plotting the evolution of the bear.

Many individual Americans are spending their own money to send men into space.

Ever since it was announced that Cmdr. Alan B. Shepard's suborbital flight last year cost at the rate of \$2.25 for each citizen, checks for that amount from proud citizens have been streaming into the National Aeronautics and Space Administration.

*James Biery*

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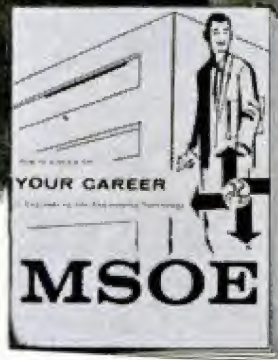
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Instruction films and a hand-operated movie-viewer teach such subjects as bowling, water skiing, dancing, judo and baton twirling. The film may be turned as slowly as the student desires, or even reversed.

The viewer retails at \$9.95, and each 50-foot reel at \$4.95. Sold by See Do Productions, Highland Park, Ill.

POPULAR MECHANICS



**Reading Time:** Less than two minutes.

**Benefits You Will Receive:** A few moments taken now may save you months of expense later.

*Would you welcome a HOSPITALIZATION POLICY in which:*

**1. ONLY YOU CAN CANCEL**

Regardless of how many times you are hospitalized the Company could never cancel your policy. Each time you were hospitalized you would receive \$100 each week for as long as you remain in the hospital . . . for life if necessary!

**2. NO AGE LIMIT**

Whether you were 1 or 100 you would receive the *same* liberal coverage.

**3. ALL BENEFITS PAID IN CASH**

Claim checks would be made payable directly to you — tax free — to use as you wish!

**4. NO WAITING PERIOD**

All your benefits begin immediately on noon the day your policy is issued.

**IF** you do not drink and **IF** your doctor has not already told you that it's time for you to enter the hospital . . . then you are eligible to apply.



For complete information **TURN TO THE NEXT PAGE.** Read it carefully. See what prominent leaders say about **THE GOLD STAR PLAN.** Read what happy policyholders write. And be sure to read the **MONEY-BACK GUARANTEE.**



# At Last- A HOSPITALIZATION

**Pays \$100.00 Weekly from First Day for Life to Readers of POPULAR MECHANICS**



day in the hospital and will continue paying as long as you are there, even for life!

If you do not drink and are carrying ordinary hospitalization insurance, you are of course helping to pay for the accidents and hospital bills of those who drink. Alcoholism is our nation's #3 health problem, ranking immediately behind heart disease and cancer! With the

If you are the one American in four who does not drink, the Gold Star Total Abstiners' Hospitalization Policy will pay you \$100.00 a week in cash, from your first

GOLD STAR PLAN you are not called upon to help pay the high bills for the ailments and accidents of those who drink. GOLD STAR rates are based on the SUPERIOR HEALTH RECORDS of Non-Drinkers!

For the first time, you can get the newest and most modern type of hospitalization coverage at unbelievably low rates, because the Gold Star Policy is offered only to non-drinkers. And your low Gold Star premium can never be raised because you have grown older or have had too many claims. Only in the event of a general rate adjustment up or down for all policyholders can your rate be changed!

One out of every seven people will spend some time in the hospital this year. Every day over 64,000 people enter the hospital—47,000 of these for the first time!

## LOW RATES FOR NON-DRINKERS

With a Gold Star Total Abstiners' Hospitalization Policy, you receive \$100.00 per week in cash, as long as you remain in the hospital, starting from your very first day there, for either sickness or accident. If your hospital stay is less than one week, you still collect at the rate of \$14.29 per day. Even if you are already covered by another policy, the GOLD STAR PLAN will supplement that coverage, and will pay you directly, in addition to your present policy. And your benefits are tax-free!

This wonderful, generous protection costs only \$4 a month for each adult, age 19 through 64, or \$40 for twelve full months. For each child under 19, the rate is just \$3 for a month's protection. And for each adult of

age 65 through 100, the premium is only \$6 a month, or \$60 for a full year.

And remember, with Gold Star, the NO LIMIT Hospital Plan, there is NO LIMIT on how long you can stay in the hospital, NO LIMIT on the number of times you can collect (and the Company can never cancel your policy), and NO LIMIT on age!

Compare this plan with others. We welcome comparison because the GOLD STAR PLAN pays from the very first day (we can't pay any sooner); and it pays forever . . . as long as you remain in the hospital (we can't pay any longer!).

## OUTSTANDING LEADERS SAY:



**UPTON SINCLAIR**, Pulitzer Prize author: "I think your idea of giving people the insurance discount which they earn by not shortening their lives with alcohol is a brilliant one, and I am glad to be counted in on it."



**DR. DANIEL A. POLING**, noted minister and Editor of The Christian Herald: "The advantages of a hospital plan which is available to non-drinkers only are obvious. The lower rate is made possible because you are not paying the bills for the illnesses and accidents of those who use alcohol."



**J. C. PENNEY**, philanthropist, Founder of the J. C. Penney Company: "I have a sincere conviction that liquor is one of the chief causes of unhappiness both to the people who drink and to those who are near and dear to them. Early in my life I decided not to touch liquor. I am delighted to know of the De Moss Gold Star Total Abstiners' Plan that provides a premium rate so much lower. This is the way it should be because most automobile and other accidents occur because of drinking."

## GUARANTEE

### Money-Back Guarantee

We'll mail your policy to your home. No salesman will call. In the privacy of your own home, read the policy over. Examine it carefully. Have it checked by your lawyer, your doctor, your friends or some trusted advisor. Make sure it provides exactly what we've told you it does. Then, if for any reason whatsoever you are not fully satisfied, just mail your policy back within ten days, and we'll cheerfully refund your entire premium by return mail, with no questions asked. So you see, you have everything to gain and nothing to lose.

## READ WHAT A BLESSING THIS PROTECTION HAS BEEN TO OTHERS:

**MR. J. WALTER DANIELS**, Fredericktown, Ohio: "I received payment for my claim and am well pleased with the service you gave. When I took the policy I never thought I would need it so soon. But we never know what will happen. It was my first time to be in the hospital."

**MR. WILLIAM C. MOORE**, East Alton, Illinois: "I want to sincerely thank you for the quick and courteous service. My illness was very sudden and unexpected. I can truly recommend the Gold Star Policy to anyone."

**ROBERT F. HAINES**, Ukiah, California: "It is with high praise I recommend this Company. My experience has been very satisfactory, and when help was needed most, you were there."

**MISS DOROTHY CARROLL**, Pleasant Valley, New York: "Received your check and wish to thank you very much. Although I had the policy only 13 days before I had to go to the hospital, there was no delay of any kind. I am very happy to have insurance with you."



# PLAN FOR NON-DRINKERS ONLY!

**NO WAITING PERIODS  
NO AGE LIMIT**



**ONLY YOU CAN CANCEL  
NO SALESMAN WILL CALL**



## Check These Remarkable Features:

- Only YOU can cancel.
- Good anywhere in the world!
- Pays in addition to any other hospital insurance you may carry.
- All benefits paid directly to you in cash—tax free!
- Claim checks are sent out Air-mail Special Delivery!
- No age limit.
- Immediate coverage! Full benefits go into effect noon of the day your policy is issued.
- No limit on the number of times you can collect.
- Pays whether you are in the hospital for only a day or two, or for many weeks, months, or even years!
- No policy fees or enrollment fees!
- Ten-day unconditional money-back guarantee!
- Every kind of sickness and accident covered except, of course, hospitalization caused by the use of alcoholic beverages or narcotics, pre-existing conditions, pregnancy, or any act of war. Everything else IS covered.

## HERE ARE YOUR GOLD STAR BENEFITS

Pays you \$100.00 weekly for life while you are in the hospital.  
Pays \$2,000.00 cash for accidental death.  
Pays \$2,000.00 cash for loss of one hand, or one foot, or sight of one eye.  
Pays \$6,000.00 cash for loss of both hands, or both feet, or sight of both eyes.

This plan offered exclusively by  
**DE MOSS ASSOCIATES, INC.**  
VALLEY FORGE, PENNA.  
and Affiliates

"Special Protection for Special People"

## HERE'S ALL YOU DO:

- 1 Fill out application below.
- 2 Enclose in an envelope with your first payment.
- 3 Mail to De Moss Associates, Inc. Valley Forge, Pa.

You will receive your GOLD STAR POLICY promptly by mail.

No Salesman will call.

## APPLICATION FOR Gold Star Total Abstiners' Hospitalization Policy

My name is \_\_\_\_\_ 02-634-0162

Street or RD # \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

Date of Birth: Month \_\_\_\_\_ Day \_\_\_\_\_ Year \_\_\_\_\_ Height \_\_\_\_\_ Weight \_\_\_\_\_

My occupation is \_\_\_\_\_

My beneficiary is \_\_\_\_\_ Relationship \_\_\_\_\_

I also apply for coverage for the members of my family listed below:

	NAME	AGE	HEIGHT	WEIGHT	BENEFICIARY
1.					
2.					
3.					

To the best of your knowledge and belief, have you or any person listed above ever had high or low blood pressure, heart trouble, diabetes, cancer, arthritis or tuberculosis or have you or they, within the last five years, been disabled by either accident or illness, had medical advice or treatment, taken medication for any condition, or been advised to have a surgical operation? Yes \_\_\_\_\_ No \_\_\_\_\_

If so, give details stating person affected, cause, date, name and address of attending physician and whether fully recovered: \_\_\_\_\_

Neither I nor any other person listed above uses alcoholic beverages, and I hereby do apply for a policy with the understanding that the policy will not cover any conditions existing prior to the issue date, and that it shall be issued solely and entirely in reliance upon the written answers to the above questions.

Date: \_\_\_\_\_  
FORM GS 713.3

Signed: **X**

**HERE  
ARE  
THE  
LOW  
GOLD  
STAR  
RATES**

	IF YOU PAY MONTHLY	IF YOU PAY YEARLY
Each adult age 19-64 pays	\$4.	\$40.
Each adult age 65-100 pays	6.	60.
Each child age 18 and under pays	3.	30.

SAVE **16<sup>2</sup>/<sub>3</sub>%**  
BY PAYING YEARLY!

THE GOLD STAR PLAN is underwritten by the following leading companies (depending upon your State of residence):

NATIONAL LIBERTY LIFE INSURANCE COMPANY  
Valley Forge, Penna.

OLD SECURITY LIFE INSURANCE COMPANY  
Kansas City, Missouri

WORLD MUTUAL HEALTH & ACCIDENT INS. CO. OF PENNA.  
King of Prussia, Pa.

MAIL THIS APPLICATION WITH YOUR FIRST PREMIUM TO

**DE MOSS ASSOCIATES, INC. VALLEY FORGE PENNA.**





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CITY..... ZONE..... STATE.....



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Available in ~~stainless steel~~ <sup>stainless steel</sup> or anodized aluminum, the decurler comes in a round or square shape. The former is \$1 and the square one, \$1.25 from Herbert Oldham, 1111 South Sumner St., Wheaton, Ill.

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together  
this  
week



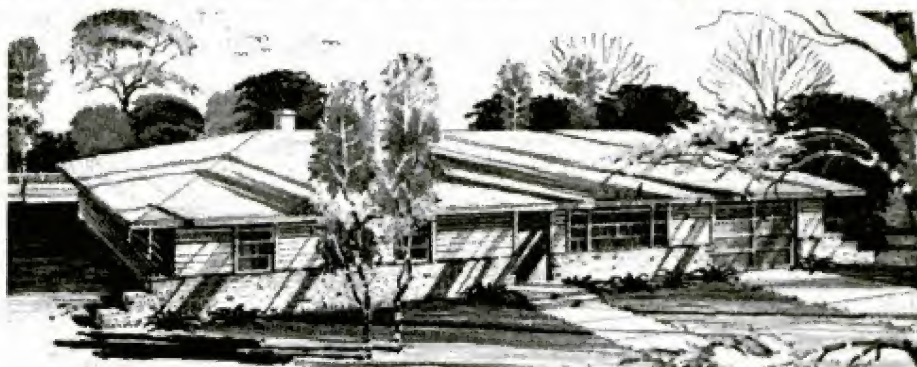
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CITY..... ZONE..... STATE.....

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## Tune in on the inventors

$$10 + 10 = 100$$

Looks like a bad mistake in basic arithmetic, but it isn't. It's right. In the two-digit language of binary mathematics—the system used in the big binary computers—"10" is 2, and "100" is 4. And  $2 + 2 = 4$ , doesn't it? Miles Libbey, of London, England, won patent No. 3,006,082 for a device for teaching addition and subtraction in the binary system. And at least some of our kids will certainly need to learn it in school, so it may be a very successful idea.

Underwater dynamite explosions, fired by oil explorers for their seismic recording instruments, can kill great numbers of fish—a fact that makes that method both wasteful of natural resources and illegal in some waters. Since less-powerful explosives don't work as well, Robert Lawrence invented a sheath of inert materials around a detonating core of ammonium nitrate and nitroglycerine, and produced the underwater equivalent of a "shaped charge." This produces the desirable seismic shock wave, but cuts fish kill to a minimum. He assigned his patent, No. 3,006,279, to the Hercules Powder Co., of Wilmington, Del.

An antihijacking collar for trucks won patent No. ~~3,004,364~~ <sup>3,004,421</sup> for William Bowler of St. Laurent, Quebec. To prevent theft of the trailer when it's standing alone, he designed a locking collar that fits over the kingpin on the trailer hitch, preventing the coupling of the trailer to any hijacker's tractor. It's both difficult and time-consuming to remove, thereby increasing the risk and discouraging a thief.

A split-level station wagon design earned patent No. 3,003,808 for John Swanberg, of Minneapolis, Minn. His design produces a wagon that resembles the familiar Greyhound "SceniCruiser" buses in that the passenger section is raised above the driver's level. The passengers have a fine view, standard seats convert into beds for family camping, and the space between the two floor levels behind the driver makes a big, lockable baggage and storage compartment.

Copies of the original patents may be ordered for 25 cents each from the Commissioner of Patents, Dept. of Commerce, Washington 25, D. C.



# POPULAR SHOPPING

worth  
writing  
for...

**Canvas** can create some unusual effects when used as a decorating material in and around your home. On the patio, canvas can provide shade and privacy, yet can easily be taken down when not needed. Many ideas for using canvas are described in "Decorating and Shading with Colorful Canvas." The price is 25¢ from the Canvas Awning Institute, National Cotton Council, Memphis 12, Tenn.

**Woodworkers** will find much to interest them in "Constantine's Catalog and Manual for Woodworkers." Fine woods, materials and tools are listed, along with some how-to information. It contains 128 pages, costs 25¢. Available from Albert Constantine & Son, Inc., 2050 Eastchester Rd., New York 61, N. Y.

**Sewer information** is contained in the 12-page booklet "Home Owners Guide to Better Sewer Service." It features 50 questions and answers about installation and service. Free from Johns-Manville, Dept. TR-240, New York 16, N. Y.

**Space-saving** ideas are featured in a free 12-page pamphlet. A powder room, service partition and storage area are among ideas contained in "20 Valuable Space Saving and Space Appealing Ideas." Address Grant Pulley & Hardware Corp., High St., West Nyack, N. Y.

**Foam rubber** is a handy material for upholstery projects. A 15¢ 8-page booklet outlines the basic steps in cutting, cementing and applying foam rubber in upholstery, and making cushions, pillows and bolsters. Write for "How to Work with Foam Rubber" to Woman's Day, P.O. Box 1000, Dept. WDL, Greenwich, Conn.

**A Florida vacation** sounds pretty enticing about this time of year. The different areas of the state and their attractions are presented in a four-color, 100-page book entitled "A Guide to Florida Vacations." It's free from Florida Development Commission, Dept. D.M., Carlton Bldg., Tallahassee, Fla.

**Our Flag** is the title of a 24-page book that tells of the origin and the history of the Stars and Stripes. Includes instructions for properly displaying the flag.



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**What Can You Do With Tiles!** A good example is the way a dark and outmoded kitchen was converted into a bright and cheerful room at surprisingly modest cost. Castoglas was used in three ways: for making the decorative glass screen, for the tiles with embeddings of leaves and butterflies, and for "glassing" the countertop. Castoglas is waterproof, heat- and acid-resistant and easily cleaned. You can also make table tiles, coasters, trays, wall decorations and embed photos, coins, sea shells and many other things. No tools, no heat required.

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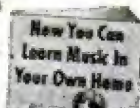
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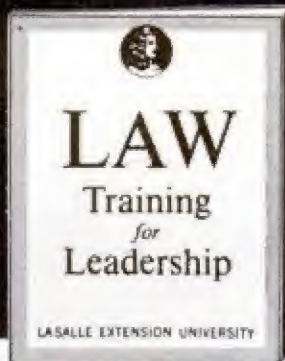
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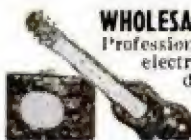
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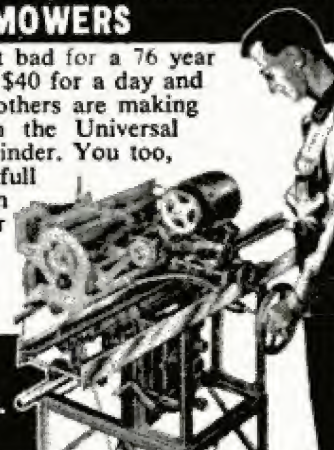
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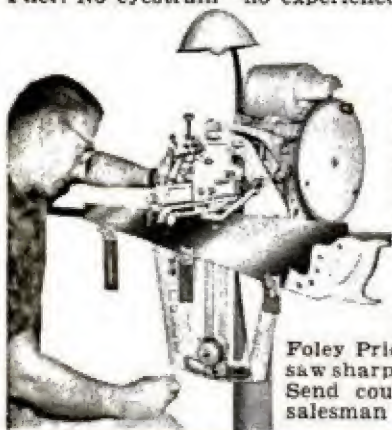


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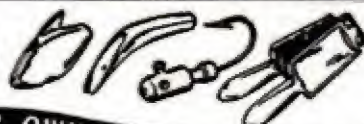
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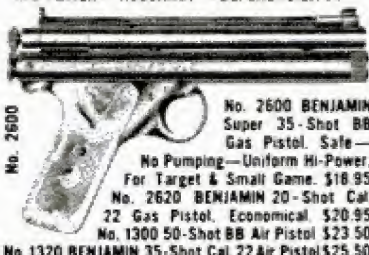
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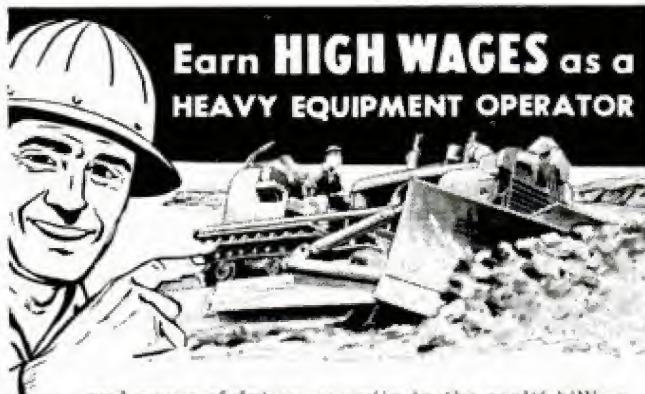
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# Pentagon sidelights

**By William R. Kreh**

Keep noisy fish quiet? Simple. Just feed them. For that suggestion, a civilian employee of the Navy's underwater-sound laboratory recently received a cash award.

It seems the fish were quite a problem to the lab. Their grunts, groans, whistles and gnashings seriously interfered with tests on underwater sound gear. Engineers tried everything they could think of to keep the fish away from their instruments—such things as repellent chemicals, electric shockers and ultra-high-frequency emitters. Nothing worked.

But a civilian who likes to fish during his lunch hour licked the problem. He punched a few holes in a can of cat food and suspended it in the lake away from the testing pier. The fish were attracted to it and away from the sensitive sound apparatus.

And the ingenious fisherman cashed in twice on his idea. Besides the money, he boosted his catch each day by tossing his line near the cat food.

Speaking of fishing, the Army's going to try it with rockets at its Redstone Missile Arsenal in Alabama. It's part of some tests by the U.S. Fish and Wild Life Service to see if rockets can't be used to shoot large nets over schools of feeding tuna. Under the plan, a gill net 240 feet wide and 350 feet long would be used. The net is folded on the deck of a fishing boat. Rockets whip it into the air and spread it out over a school of tuna up to 500 feet away from the boat. If the rockets work all right on the lake at Redstone Arsenal, further tests will be made in the Gulf of Mexico.

Foam-rubber "falsies" sold so fast at a West Coast department store that it had the sales department baffled. Further investigation showed that pilots at a nearby Air Force base had discovered that falsies worn inside their helmets made perfect ear-warmers at 30,000 feet.

The Army's not talking about it, but there are reports it's experimenting with a plastic auto that has parts so cheap that even a failing engine would be thrown away rather than repaired. The whole car, it's reported, would cost only about \$1300.

(Continued to page 56)



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Want a real Old-Fashioned? Navy men in the Antarctic have found a new way to make fizz water. They drop a chip of ice from an Antarctic iceberg into a glass of water. The entrapped air makes a popping sound when it's released on melting. This air in most instances is many centuries old.

A unique washdown system is used on the Military Sea Transportation Service's transport ship USNS Point Barrow, thanks to the ingenuity of her chief engineer. He placed numerous nozzles around the ship's regular railing, hooked the railing up to water pumps, thus providing an effective spray and doing away with the need for hoses.

An insect-repellent pill is under development by Army researchers. Swallow the pill and your body throws off an odor that is reported to fend off pesky biting insects.

Radio receivers as small as fountain pens are undergoing research by the Army. They're made with tiny electronic micro-modules only one-tenth the size of present-day miniaturized circuits.

A purely mathematical explosion has been created by the Navy and a movie taken of it. It's all done by computer, which calculates where shock waves, splintered bits of steel container and everything else in the explosion will be at various brief time intervals after detonation. From these calculated positions, the shape of the explosion can be traced and filmed. Play back the film and you get a movie of the explosion from the inside.

A portable nuclear power plant is being developed by Army engineers. It weighs a little more than 38 tons and can be carried on a standard trailer-tractor, by ship or barge, by railroad flatcar, or even—in separate parts—by cargo planes.

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**MAKE** \$46 From square foot plywood: jigsaw necessary. Free details. Woodart, Bridgewater, Mass.

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**\$400.00 MONTHLY** Raising giant fishworms. Soilless method. Charlie Morgan, Bushnell, Florida.

**HOW** And where to obtain capital. Write: Reliable Service, Rome City, Ind.

**SELL** Books by mail. 400% profit. Royal, Box 368-X, Cleveland 27, Ohio.

**PLASTERCRAFT** Molds, liquid rubber, plasters, floccs, candle supplies. Catalog and manual free. Blue Rapids Supply, Blue Rapids, Kansas.

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**JOKE Merchandise.** Rack consignment deals. No selling. Rush \$1.00. Ten samples, profit plan. Robbins, 127-G West 17th Street, New York City 11.

**EARN \$3 hourly, spare, full time,** looking up information at your local library. Operate research bureau. Details free. Service, 81C Knickerbocker Station, New York.

**AMAZING Profits in exterminating.** Full time — part time. Free details. Baylab 21M, Cambridge, Maryland.

**EVERYBODY Likes candy and popcorn specialties.** Learn to make professionally home. (Our 50th year.) Ragsdale Candies, B-107, East Orange, New Jersey.

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**11,000 NEW Prospects daily.** Baby record books, shoes, albums. Sell mailorder. Use our literature. Write: No-Co-Ro, Capitola, Calif.

**\$1,000 MONTHLY Spare time tape recording** weddings, radio commercials, sound effects, hundreds of ideas and complete plans! Famous course "Tape Recording for Pleasure & Profit" measures an inch thick, a foot square, loaded with money-making ideas with a tape recorder! Complete course including 45-minute tape of demonstrations and instructions only \$14.95 plus \$1.00 postage and packing. Or send \$2.00 for complete booklet on "How To Record Weddings" and illustrated literature on the course. Dixieland Sound, Asheboro 17, North Carolina.

**"MAILORDER Laws and Regulations."** Explains mailorder licenses, mailorder taxes and mailorder legal requirements. Avoid trouble with the government. Read latest revised enlarged edition. \$2.00. (Particulars free.) Neil H. Tasker, Shamokin, Pennsylvania.

**SELL By mail.** Mail order specialist shows how to start on low capital. Modern merchandising methods, not crackpot schemes. Free details. Larry's Specialties, 97-06 63rd Drive, Rego Park 74, New York.

**SIGNS.** Sell restaurants, bars, etc. Samples \$1.00. Box 9563, Jackson, Miss.

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**OPERATE Home mailorder business.** Vosacek Printing, 4444AI Ute, San Diego, 17, Calif.

**EARN Money raising fishworms for us!** Write: Oakhaven 38, Cedar Hill, Texas.

**SEWING Machine, vacuum cleaner** repairing, \$3-\$5 hourly. Gardner, 401 Johnson, Jenkintown, Penna.

**MAILORDER: Extra income, spare time.** Easy. Write: American Distributors, Box 409, Niles, Michigan.

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**UNIQUE Process for glaze finishing** masonry offers terrific business opportunity. Free photo, details. Plasticon Company, Box 105, Grove City, Penna.

**BEFORE You buy any business or franchise in America** find out why 90% fail. Send \$1.00 for Donoho's Business Buyers Guide. Satisfaction guaranteed. Wm. Donoho, 493 East 8th Street, Chico, Calif.

**PROSPERITY In garden golf.** Invest now. Details. Brockway, Box 3762, Portland 8, Oregon.

**GUARANTEED Market.** Raise fishworms for us. Free details. Golden Farms, Lubbock, Texas.

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**NATURAL Molding rubber, extra thick.** Free samples. W. Wooley, 2801-A Latrobe, Peoria, Illinois.

**LEARN Landscaping and the growing of plants.** Start a profitable business part or full time. Free information without obligation. National Landscape Institute, Dept. MC-12, 11826 San Vicente Blvd., Los Angeles 49, Calif.

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**FREE Report: "609 Unusual, Successful Businesses."** Box 1001-PR, Evanston, Illinois.

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**MAKE Money making leathersgoods.** 1148 ideas. Free information. Tandy Leather Co., Box 791-F2, Fort Worth, Texas.

**SECRETS! Secrets! Mail order success** revealed by internationally famous expert who discovered how to make home business fortunes. Beginners: Get free copy "How to Make Money in Mail Order." Disclosed free advertising, profitable products, everything! No obligation. Write Mallico, 1554 Sepulveda, Dept. D701, Los Angeles 25.

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**EXCITING Puzzles! Cash prizes! Write:** Spence, Box 11569, St. Petersburg, Fla.

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**BIG Money raising fishworms and** crickets. Free literature. Carter Hatchery, Plains, Georgia.

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**LEARN** The secrets of repairing junk batteries, generators, starters, profitable, easy, at home. Free particulars. Batterymen, 3465 Forrest, Santa Clara, Calif.

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**PIANO** Tuning learned at home quickly. Tremendous field! Be independent! Information free. Empire School, Dept. P, Champaign, Ill. (Founded 1935.)

**TEAR** Out this ad, and mail with name, address for big box of home needs and cosmetics for free trial, to test in your home. Tell your friends, make money. Rush name. Blair, Dept. 31FA, Lynchburg, Va.

**MASSIVE** Cash profits with this little known money-making opportunity, making gravestones for pets. Easy to make, small investment, large returns, work home, no selling, free details. Laneville, 5420-B Home Gardens Dr., Reno, Nevada.

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**CALENDARS**, Novelties. Full or part time. Liberal commissions. Fleming, 6535-A Cottage Grove, Chicago 37.

**BIBLE** Profit 130% — why make less? Literature free. Bible, 4813A Hurford, Chester, Penna.

**MAKE** Extra money—Big cash commissions plus premium for you and your customers. Sell advertising book matches. Sensational new tenor guitar glamour girls, hillbillies; dozens others. All sizes. Quick daily sale; big repeat business. Free master kit makes selling easy. No experience necessary. Superior Match, Dept. M-162, 7530 Greenwood, Chicago 19.

**MAKE** Big money taking orders for Stark dwarf fruit trees. Everybody can now grow giant size apples, peaches, pears in their yards. Also shade trees, shrubs, vines, roses, etc. Outfit free. Stark Bros., Desk 30112, Louisiana, Mo.

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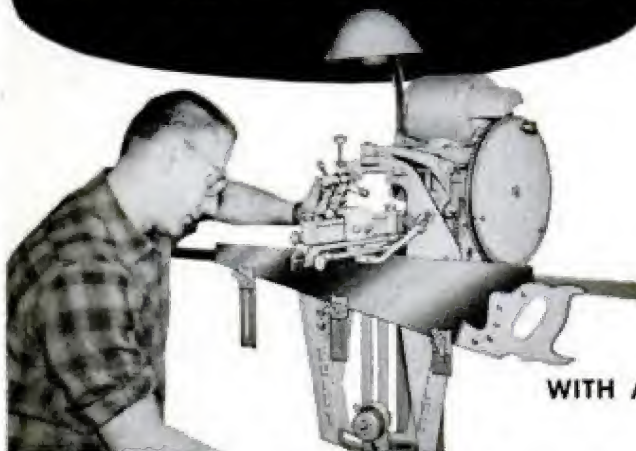
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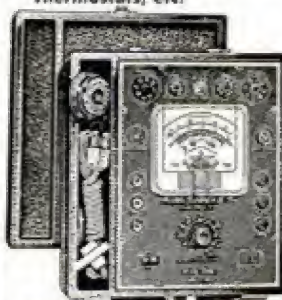
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AD 61094

## Converts Numbers Into Voice

Tape recordings of the human voice are being converted from a set of numbers by a computer in tests which may lead to voice-operated typewriters, voice dialing of telephones or voice-routing of mail.

The "speech-analyzer-synthesizer" program is being conducted by the applied-research laboratory of Sylvania Electric Products. The object is to find a more efficient way to map speech for use in automatic speech-recognition systems, which are essentially the translation of human speech to a mechanistic language that can be operated upon by a computer or used to control a machine. Translating the machine language back into human speech is the process in reverse.

Sylvania's method analyzes the wave forms that comprise speech in terms of a fixed set of 30 orthonormal (uncorrelated) functions, chosen to resemble sound-wave forms that occur naturally in speech. The 30 give sufficient fidelity for most purposes.

## Emergency Brake

In case of brake failure due to fluid loss, a new safety-brake attachment automatically takes over to maintain braking action.

The unit is installed between the vehicle's master cylinder and the two lines supplying the front and rear brakes respectively. Should either the front or rear brakes fail, a nylon piston activated by the flow of escaping fluid blocks off an exit port, leaving the remaining set of brakes fully operative.

The attachment, which sells for \$14.95, is made by Alex Manufacturing Corp., Bldg. 196, N. Y. International Airport, Jamaica 30, N. Y.

## Braille in Plastic

Called the first real change in the method of printing in braille since the process was started about 100 years ago, textbooks for the blind will be made by baking plastic dots onto paper instead of embossing them in the paper itself.

The braille alphabet consists of six dots, in various combinations, within the shape of a domino six. Until now, the dots have been embossed on special Manila paper by distorting the fibers. The dots wear down in time because of the friction of moving fingers. The new method, invented by an officer of the Royal National Institute for the Blind in England, will use solid plastic dots on special thin paper that can stand the curing process in infrared ovens.



Not everyone does as well, but T. N. CODY, who started a business of his own, reports...

For 12 months I've averaged

**\$800 PER MONTH INCOME**

**—most of it clear profit for me!**

Many men have discovered how to be independent, to be free of layoffs and bosses. C. G. Naples grossed more than \$200 his first week. A father-son combination grossed \$44,000 their second year. H. Lemon says, "I netted \$133 in one 8-hour day."

How much you make depends largely on you. You need no special skill, no large investment. Start part time if you wish.

**NO SHOP NECESSARY** • Our Electric Deterger shampoos rugs, carpets right on floor—removes dirt and grime and helps to show their natural color and beauty. So efficient and safe it is used by largest railroads and hotels.

► **This is not a lease proposition.** You own the machine, you work when and where you please and all the money you take in is your own. You take no risk. Machines fully guaranteed.



**MAIL COUPON TODAY FOR FREE BOOK**

VON SCHRADER MFG. CO.  
110 "R" PL., Racine, Wisconsin

Without obligation send me **FREE** booklet about your RUG DETERGER and tell me how I can start my own permanent, profitable business.

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"To put it in reverse you just honk the horn."

JANUARY 1962

NOW! COPPER SWEAT JOINTS  
**THE EASY WAY!**

**SWIF SOLDER**

**JUST BRUSH ON**



**...AND HEAT!**



Make perfect leak-proof sweat joints every time with Hercules SWIF Solder, the real 50/50 tin-lead solder pre-mixed with flux in easy-to-use paste form. Save time and money, too. Just brush on, join, and heat for neat, strong joints. SWIF solders all common metals (except aluminum) and works with a torch, soldering iron, or soldering gun. This grade available in economical 4 oz., 1/2 lb., 1 lb., and 3 lb. cans at your plumbing supply or hardware dealer. See for yourself how easy any soldering job is when you use SWIF.



Write for free do-it-yourself soldering folder.

Hercules Chemical Co., Inc., 416 B'way, N.Y. 13



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FOR NEW ACCOUNTS AND ADD-ONS

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- \$ 250 TO \$ 499 — Shaeffer Pen and Pencil Set
- \$ 500 TO \$ 999 — Leatherette Travel Clock
- \$1,000 TO \$1,499 — Dormeyer Hair Dryer
- \$1,500 TO \$2,499 — 52-Piece Stainless Steel Set
- \$2,500 TO \$4,999 — \$59.95 Benrus Wrist Watch
- \$5,000 TO \$9,999 — Westinghouse Elect. Blanket
- \$10,000 AND UP — \$71.50 Gruen Wrist Watch

(GIFT OFFER VOID IN STATES WHERE PROHIBITED)

*Savings Postmarked by Jan. 31st  
Earn From The First of The Year!*

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*and Loan Association*

65 North University Avenue, Provo, Utah

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☐ ENCLOSED IS REMITTANCE OF

\$..... TO OPEN MY ACCOUNT

NAME.....

ADDRESS.....

CITY..... STATE.....

Gift Choice:.....

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PROBLEMS  
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EVERYDAY  
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More than 500 subjects, covering almost every  
conceivable problem or project that ever faces a  
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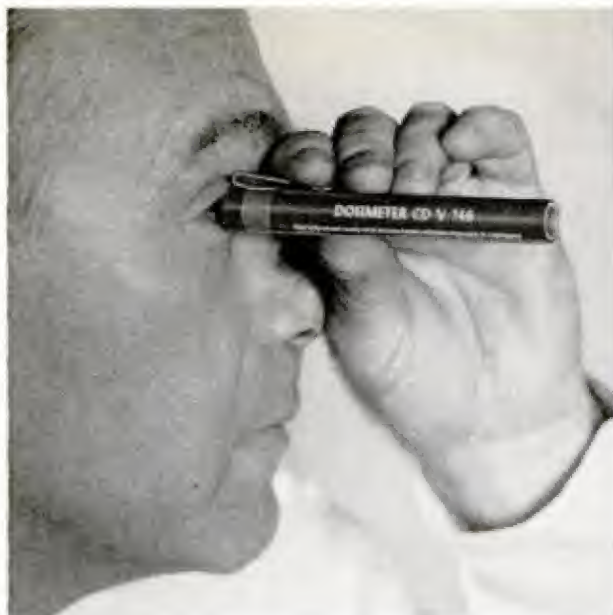
Please send me your FREE service file.

Name.....

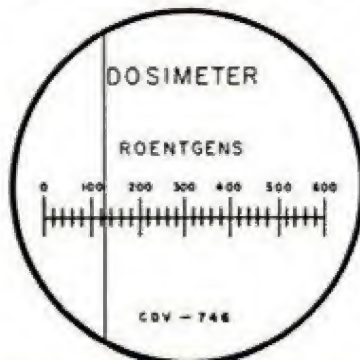
Address.....

City..... Zone..... State.....





## Kit Measures Radiation



It is now possible, should a nuclear war make it imperative, for individuals to measure rates of radiation received per hour and to chart amounts received over weeks or months. Such information would be helpful in determining when it would be safe to come from shelters. The Bendix Corp., Cincinnati, Ohio, distributes radiation measurement kits, priced at \$24.95. Its ratemeter shows roentgens received per hour; the dosimeter keeps track of long-period doses. A charger, bottom, resets these counters.

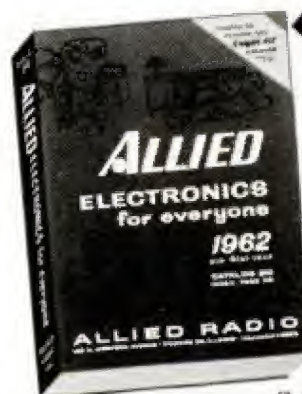


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FOR MODERN LIVING**

IT'S FUN...IT'S EASY WITH MONEY-SAVING

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A PRODUCT OF ALLIED RADIO



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ELECTRONICS  
CATALOG

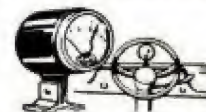
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Dozens of new hobbyist kits, including amazing Electronic Science Lab—over 100 projects!



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Easiest Terms

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100 N. Western Ave., Chicago 80, Ill.

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**WORLD'S  
BIGGEST**



# How to think a full-size car into 197 inches





**The new Ford Fairlane 500 is so beautifully logical you may think it was easy to design. But to enclose big-car room, ride and performance inside a handy 197 inches—that demanded the most imaginative engineering of the decade!**

The day Ford engineers started sketching out the Fairlane for 1962, they began the most intricate project of their careers. For the Fairlane was not to be another compact car (a thorny enough problem) but a *full-size* car inside 197 inches of total over-all length.

It had to be lean and nimble outside to suit today's traffic. But it absolutely could not give up the stretch-out room *inside*—the "tall" seats that are so comfortable on long journeys, the extra leg room for long-shanked drivers, the easy-fitting space for six, the cavernous trunk capacity Americans truly need. And, above all, it could not shade by a hair the "feel" of Ford full-size quality—the velvet ride, the silence, the innate craftsmanship. Or the punch and sparkle of full-size performance. One more thing: Fairlane had to have the twice-a-year maintenance schedule introduced by the Galaxie.

### First step—unitized body

The thinking began with unitized body construction—stronger because it becomes a single welded unit, lighter because there is no heavy frame. That saved hundreds of pounds, and permitted smaller engines (they could give the same performance with less power—and less gas—because there wasn't so much weight to lug around). Unitized construction also produced full-size room within the Fairlane 500's trim new dimensions.

### The "Watchmaker's" V-8

They thought up a new engine to go with the standard 101 horsepower 6—a new V-8 with only 221 inches of displacement, an easy 8.7 compression ratio for regular gas—and 145 cream-smooth horsepower. Motor experts predict this will be one of the great "classic" engines of our time. Molded in time-tested cast iron, it uses Ford-pioneered "precision-cast" foundry techniques to pare weight to only 450 pounds complete. Extremely short stroke (2.87 inches), separately mounted shell-cast rocker arms for lightweight valve train, outer-end counter-balancing and hydraulic valve lifters give dynamo smoothness at the highest r.p.m. No two exhaust valves are side-by-

side to build up a hot spot. And typical of the basic sturdiness is the fact that the "valley" cover is *cast* as part of the intake manifold, not stamped metal (less noise, better oil seal). The result is a new kind of engine—one that blends V-8 smoothness and sparkle with six-cylinder thrift.

### "Torque Box" Isolation

Fairlane engineers also thought up a new way of putting velvet into the ride—"torque boxes" welded between the members that hold the suspension and the main body itself. These look like boxes of sheet metal—but they are "tuned" to a subtle, precise degree of flex. Like the plastic-sheathed shank of a golf club they take the sting out of any tiny road vibrations that get past Fairlane's sophisticated suspension system—and they also break the cycle of road noise before it telegraphs into the body. Add this to Fairlane's generous 115.5-inch wheelbase, massive sound-proofing and total quality control and the impression of solid luxury is extraordinary.

But these highlights only hint at the advances 50,000 hours of laboratory study created for America's new kind of family car. You'll have to study it—and *drive* it—before you begin to know how astonishing the new Fairlane really is.



**FORD**  
**AIRLANE 500**

ONLY THE NAME'S THE SAME!

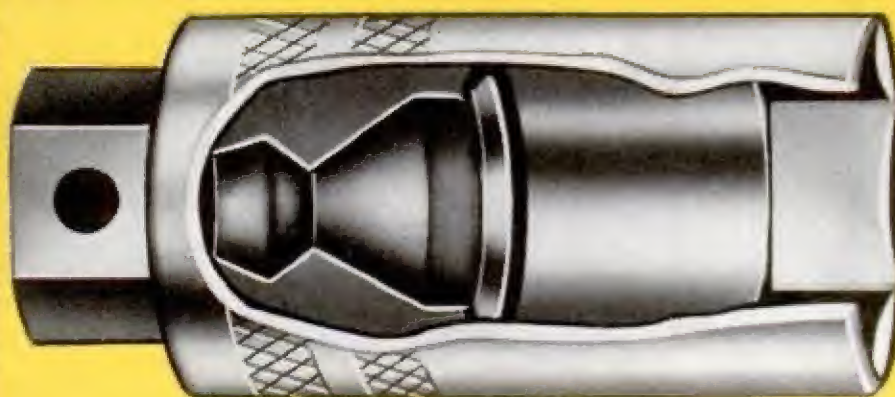




## Downhill Skier Hits Silk Instead of Snow

Beginning skier gets a brake on downhill runs with a parachute braking device designed to keep him from building up dangerous speeds and to help him stay upright.

The triple chute pack is used for beginners; chutes are removed, one at a time, as the trainee gains experience. He graduates when he can ski without them.



**PROTO'S SPARK PLUG HOLDING SOCKETS.** Revolutionary neoprene insert prevents burned hands, cracked porcelains, damaged electrodes. Available in  $\frac{3}{8}$ " (No. 5026HP) and  $\frac{1}{2}$ " drive (No. 5326HP). Both sockets fit all standard 14mm plugs in domestic and foreign cars. Turn with fingers, flat wrench, ratchet, torquer. Look for counter display-demonstrator. You'll find over 2,200 quality Proto tools at auto parts, hardware and industrial outlets. Professional performance guaranteed.

**PROTO TOOLS**  
PROFESSIONAL QUALITY TOOLS

Division of Pendleton Tool Industries, Inc.

2202 Santa Fe Avenue, Los Angeles, Calif. • 502 Allen Street, Jamestown, N. Y. • 1702 Oxford East, London, Ontario, Can.



A number of one-man mail order enterprises are paying their owners an income of \$40,000 to \$50,000.

## SPECIAL OPPORTUNITIES



Mail order is big business. Annual catalog sales volume of Sears, Roebuck and Co. is over 700 million dollars!

### HOW TO START

# Your Own Mail Order Business

You can make a fortune by mail. New firms will set you up in a fabulous mail order business of your own! They'll make up your catalogs, prepare your advertising, supply mailing lists and even ship your products for you!

### By Robert Stephenson

When Anthony Sambati injured his back and was laid off from work he never dreamed it would be a blessing in disguise. Bedridden for weeks, he decided to start a small mail order business. This was something he could run right from his own home and required very little capital to begin. In fact, Sambati started with less than \$85.00.

(Advertisement)





After a short time in mail order, Sambati soon had a beautiful home with all the luxuries of a successful businessman.

He figured that a small mail order business might provide a temporary income to support his family until he got back on his feet. His first step was to obtain a franchise from a large wholesale mail order firm which supplied him with all the necessary catalogs and mailing literature. It wasn't long until his spare-time venture blossomed into a booming enterprise. Drawing a small salary and pouring the rest of the profits back into the business, he soon had others working for him! Today he owns a large retail store, his own warehouse and a beautiful home with all the luxuries of a successful businessman.

Sambati's story is typical of a number of men and women who began a small mail order business with absolutely no previous experience, and made a huge success of it. These 'little' people are quietly pocketing big profits every day—many content to keep the business small . . . spending an hour or two each day in the privacy of their own home. No bosses, time clocks or small pay envelopes. No door to door selling, in fact, you never even meet your customers face to face.

Yes, a small one-man mail order business is ideal for anyone wanting a chance to gain financial security and independence. Yet thousands try mail order each year and fail, simply because they don't learn the few simple secrets of success early in the game.

Take the case of Bud Sheer who had been working for a theatre in a small New Jersey town. With only a few hours spare-time to spend each morning, he tried mail order to supplement his regular income. Like many beginners in this field, Sheer was faced with the problem of finding good mail order items which would have a high mark-up and repeat sales potential. But the biggest obstacle was the expense of printing a catalog.

Then he heard about the A. J. Statile Co. of Hillsdale, New Jersey — an organization set up to aid the small mail order beginner.

He wrote to A. J. Statile Co. for full information, sent in his application for a franchise and within a short time the cash began rolling in. Today Bud Sheer owns the theatre he once worked for. Sheer attributes his success in mail order to the A. J. Statile Co. Actually, the theatre he owns has become a side investment.

He still uses the beautiful 300 page mail order catalogs supplied by A. J. Statile Co.

How does the Statile Co. help the beginner get a sound start in mail order? Very simply. Just as Henry Ford made automobiles within the reach of the general public—by mass production and large volume.

Let's take a few specific examples:

(1) All franchised dealers of A. J. Statile are offered ready to mail catalogs and sales literature. Each mailing piece has the dealer's name and address printed right on it. By printing millions of catalogs, Statile is able to offer these at a fraction of their regular cost. The artwork and layout costs for these catalogs would run into thousands of dollars for the beginner if he were starting from 'scratch'.

(2) Since all mailing material and catalogs contain your name and address, all orders come directly to you. Yet you don't have to invest one penny in inventory. All merchandise is stocked for you. In fact Statile has over \$3 million dollars worth of mail order merchandise at your disposal.

(3) All packaging and shipping is done for you. You simply send a shipping label to Statile together with the wholesale cost of the items, and the merchandise is shipped directly to your customers under your own shipping label.

(4) A consultation service is provided to answer any questions you may have. You receive a secret list of over 100 national magazines which run free ads. You'll be shown how to obtain free publicity on your own mail order items. In addition, you obtain trade names and addresses of over 150 other mail order wholesalers who drop-ship top mail order items for you. You'll also be given all the government laws and regulations pertaining to a home operated mail order business. These laws are a 'must' for all beginners.

All this valuable information is covered in the Statile Mail Order Survey which every new franchised dealer receives from Statile before they begin. Formerly sold for \$25.00, this survey has become the 'bible' of the trade. Mr. J. M. of Baltimore, Md., writes, "To tell the truth, all the information in regard to obtaining free ads is alone worth the \$25.00 I paid you . . ." J. D. of Kalamazoo, Mich.,

(Advertisement)



states, "Just a personal note to say I am most satisfied with my \$25.00 investment. Your sales plan is simple and well organized . . ." These are only a few of the many testimonials received praising the Statile Mail Order Survey.

(5) The catalogs and mailing literature offered by Statile Co. cover every conceivable mail order item. You select the field you are interested in . . . BABY ITEMS, TOYS, APPLIANCES, VITAMINS, BOOKLETS AND



The thrill of receiving money in your morning mail is one you'll never tire of.

**MAIL ORDER COURSES**, you name it, Statile has the catalog or mailing piece. Select your market, order your mailing literature and you're in business.

(6) You'll be told how to compile your own mailing lists—and this is the most important part of your business. Many a beginner has fallen by the wayside simply because he mails his catalogs to a poor list of names. Suppose, for example, you offered a beautiful scale model of a 40' Chris-Craft cabin cruiser by mail. You would probably make your mailings to boating enthusiasts and the chances are that nine times out of ten your mailings would show a loss instead of a profit. How would Statile help you solve this particular mailing list problem? He would show you where to get the names and addresses of *actual owners* of 40 foot Chris-Craft cabin cruisers! Surely every owner would like to have a scale model of his own boat. Strange as it may seem, such a mailing list is available to anyone. The secret is where to find it. This is just one example of how an experienced mail order expert giving you personal advice, may mean the difference between success and failure!

This same method of obtaining selective specialized mailing lists may be applied to practically any market . . . selling baby items to new mothers, selling toys to young children, etc., etc.

So much for starting your own mail order business. Now, a word of caution. **OBTAIN YOUR MAIL ORDER FRANCHISE FROM A**

**REPUTABLE MAIL ORDER FIRM.** Unfortunately, during the past few years a number of ads have appeared in newspapers and magazines offering to start people in mail order. The ads are grossly misleading. Many imply that you can become a millionaire over night if you use their catalogs. Beware! Particularly if they operate their own mail order business direct to the consumer. These firms compete with their own franchised dealers! They could just as well mail all the catalogs themselves. They don't need you.

Other shady firms fail to drop-ship your orders promptly, thereby losing customers for you. In mail order, prompt shipment is an absolute requirement for a successful operation.

Deal only with firms whose business is preparing catalogs and shipping merchandise. They operate on a strict wholesale basis for franchised dealers exclusively. Such a firm is the A. J. Statile Co. Letters from successful franchised mail order dealers speak for themselves. A woman from Milwaukee writes, "It has been better than my expectations." A gentleman from California states "we are quite pleased with the response we are receiving." Another man from Wisconsin writes, "To say the least, I am more than satisfied."

Yes, a small mail order business offers you an opportunity to earn a second income, or—if you work at it in earnest, a chance to strike it rich. The young housewife in St. Louis may be content to make an extra \$20.00 a week . . . the office worker in Los Angeles may be aiming for \$150.00 weekly full time business . . . and the ambitious schoolteacher in Newark may reach \$20,000.00 a year. What is your objective? Set your own goal, pick your own hours, and the sky is the limit.

Even a government report stated that a number of the most successful one-man mail order enterprises make as high as \$40,000 to



Big firms will carry all stock for you. They ship orders direct to your customers using your own shipping labels.



# Your Own Catalogs of Top Mail Order Items!



A. J. Statile Co. will prepare your catalogs, write your sales letters, supply mailing lists and even ship merchandise for you, using your own shipping labels!

\$50,000 a year! But frankly, this is the exception rather than the rule. Most mail order operators are content to earn a comfortable living doing little physical work, but enjoying their work thoroughly! We don't say you'll be a mail order millionaire or another Sears & Roebuck, but if you're looking for a business of your own with financial security, the answer is mail order. If you've already tried mail order with little or no success, don't give up! Try to analyze what went wrong. Success comes only to those who keep trying and learn from their own mistakes. Again we emphasize, deal only with a reputable firm.

The A. J. Statile Co. has been in business for over twelve years.

They gladly furnish bank or trade references upon request. They are probably one of the largest mail order wholesalers in the country. Whether it be toys, gifts, vitamins or appliances—they've got it ready to ship under your label **WITHIN 24 HOURS!**

Firmly convinced that no other business offers the tremendous opportunities of mail order, A. J. Statile, president of the firm, is an outspoken advocate of the man or woman who wants to start in business for himself. As Statile puts it, "by all means, start your own business and start **NOW!** If you want a chance at security and financial independence make your choice mail order. There's nothing like it. Absolutely nothing!"

## FOR FREE DETAILS

**Mail coupon below — no obligation**

A. J. Statile Co., Dept. 25 • Statile Building • Hillsdale 25, N. J.

Dear Mr. Statile:

Please send me complete **FREE** details telling me how I may obtain a franchised mail order dealership with your firm. I understand I am under no obligation and no salesman will call on me.

NAME..... AGE..... SEX.....

ADDRESS .....

CITY..... ZONE..... STATE.....

PREVIOUS EXPERIENCE, IF ANY.....

(Advertisement)





1902



1962



## *This month we are sixty years young.*

*We are proud that Popular Mechanics has helped show three generations of readers the excitement of discovery.*

*... Discoveries that lie both inward to the heart of all matter and outward to the unfathomable reaches of the universe.*

*... Discovery of new ideas—new inventions ranging from the final solution to an age-old problem, to an item as ordinary as a better clothespin.*

*... Discovery of the unsuspected skills that lie within each man's hands and mind. Discovery of the quiet enjoyment that can be his in that "inner castle" of his home—his shop.*

*For sixty years PM's purpose has been to scout the frontier of such discoveries. Our partners in this stimulating venture have been the alert readers of Popular Mechanics. Your faithful support testifies to the success of our efforts and the strength of our partnership.*

*In this special anniversary issue we will explore together some of the exciting, significant and rewarding frontiers of discovery.*

*And—most exciting of all—beyond those frontiers are still others.*

JOSEPH R. BUELL, JR.  
Publisher



# The Way-Out World of Solid State



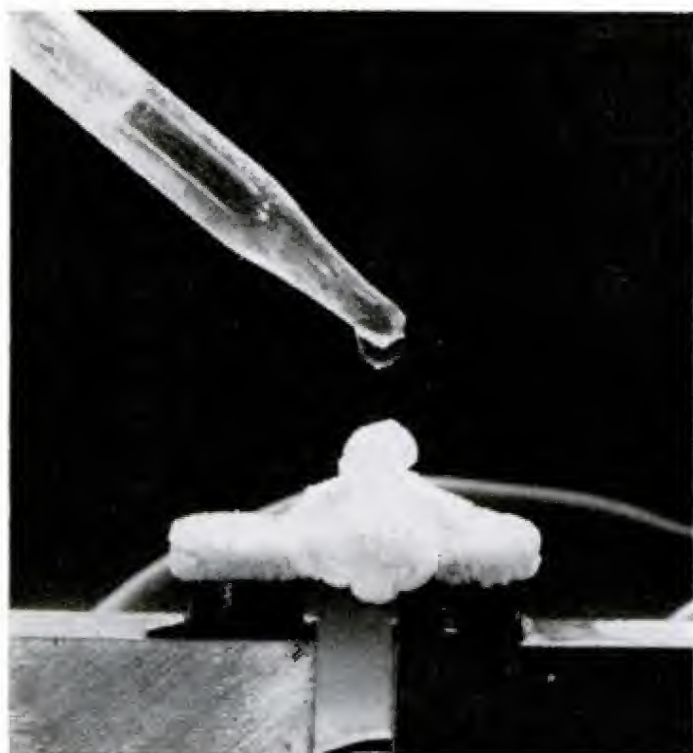
By Richard F. Dempewolff

**AMPLIFIER** in tweezers is smaller than a dime, performs function of conventional amplifier on table

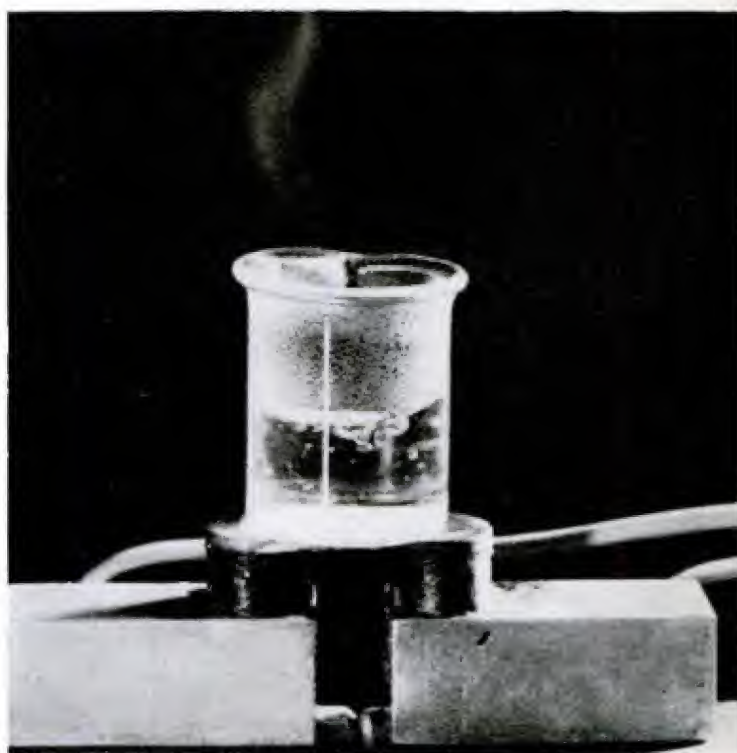




*This startling new science will soon deliver such incredible products as a hi-fi amplifier the size of a dime, picture-frame TV and computers as small as buttons*



**REFRIGERATOR** without moving parts cools when direct current is applied to junction of semiconductors



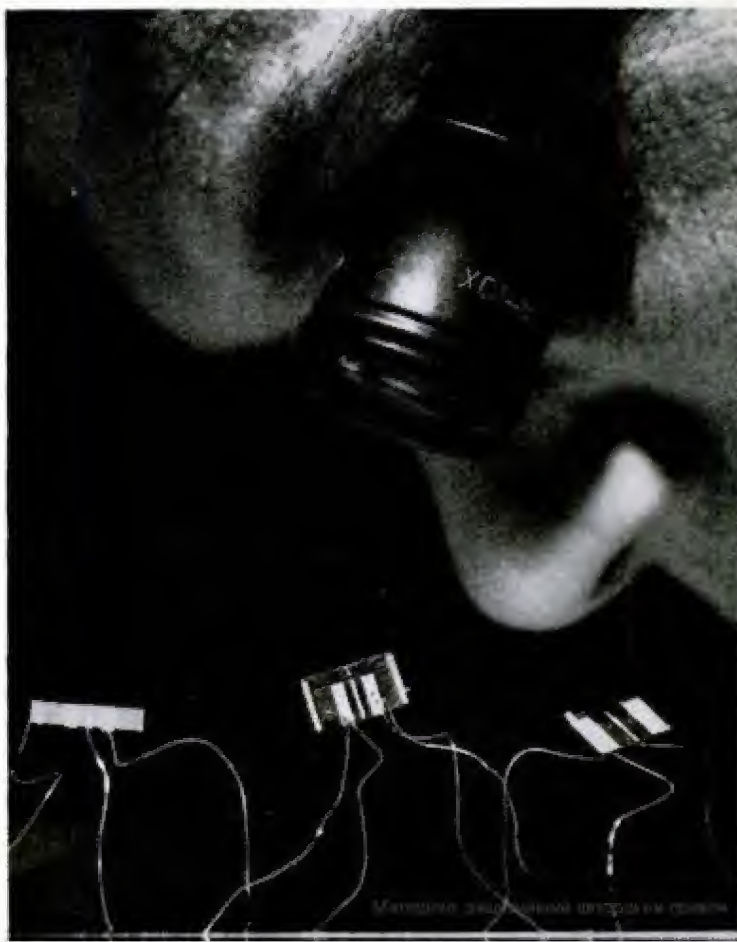
**HEATER** boils water when a direct current is applied to junction of two dissimilar thermoelectric materials

**L**AST MARCH, a technician at Wright Air Development Center in Dayton, Ohio, amazed a group of newsmen by tuning in a dozen stations with a radio consisting of six sequinlike wafers on a thin sheet of plastic the size of a matchbook flap. Since then an engineer in an eastern electronics laboratory has demonstrated a solid chunk of stuff about the size of a BB pellet that contains the entire guts of a two-tube radio.

In Dallas, a group of electronics wizards from Texas Instrument Co. recently showed off a vest-pocket computer. It was about the size of a pack of cigarettes. It can handle all the tasks performed by a miniature transistorized computer (developed last year) that is 150 times its size and 48 times heavier. If you want one, the new 10-ouncer sells for about \$30,000.

At the Westinghouse Labs in Pittsburgh, Pa., technicians will show you a one-pound magnet the size of a doughnut. It is 10 times more powerful than the 20-ton, car-size magnet on a junk-yard magnetic crane, but it is only *half* as powerful as a newer and *smaller* one they're making now! In General Electric's Schenectady, N. Y., headquarters you learn that, within a year or so, you may be listening to matchbox-size

**ELECTRONIC CIRCUITS**—solid blocks of materials on spidery electric leads—get scientist's close-up scrutiny





# SOLID STATE TRICKS AND SOME OF THE TOOLS THAT PERFORM THEM

PHENOMENA	DEVICES	JOB'S PERFORMED	WHAT'S IN IT FOR PEOPLE?
<p><b>Semiconductance:</b> Ability of some materials that are neither insulators nor conductors, to carry current under certain conditions.</p> <p><b>Tunneling:</b> Ability of charged particles to pass through energy barriers at high speeds.</p> <p><b>Hall effect:</b> Ability of semiconductor material, when placed in a magnetic field, to bend a current flowing through itself.</p> <p>By "sputtering" semiconductor material on ceramic wafers, circuit loops can be made. These are stacked to make pill-size elements for radios, computers, etc.</p> <p>Newer techniques involve "doping" areas of semiconductor material with impurities to perform different functions. Result is a solid block that becomes a self-contained circuit.</p>	<p>Transistors</p> <p>Diodes</p> <p>Silicon-controlled rectifiers</p> <p>Tunnel diodes</p> <p>Hall generators</p> <p>Thin-film circuits</p> <p>Monolithic blocks</p> <p>Molecular blocks (block amplifiers, notch filters, etc.)</p>	<p>Amplification, switching, rectification, HF power generation, modulation, conversion of light to electricity, tuning, triggering, logic.</p> <p>Measurement of magnetic fields, and control of flow, pressure and temperature. Experimental power generation.</p> <p>Audio and visual amplification, adder circuits, flip-flops, oscillators, phase shifters, switching, tuning, radio reception, power generation, transmission.</p>	<p>Today's tiny portable radios and TV, smaller than a shoebox. Smaller TV is on the way. Computers, the size of a cigarette pack have already been built, thanks to these tools. So has a crystal the size of a match head, which contains the entire guts of a two-tube radio.</p> <p>Coming up are radio sets the size of after-dinner mints; pill-size wireless "speakers" worn in each ear, so wearer can have stereo music wherever he goes; speakers built into drapery fabric, wall-paper and ceiling material; cordless telephones; tiny computers that can "think"; microminiature power generators for home appliances.</p>
<p><b>Photoelectrics:</b> Ability of light waves, impinging on semiconductor material, to generate electrical effects within the material.</p>	<p>Photoconductors</p> <p>Photodiodes</p> <p>Solar cells</p> <p>Photovoltaic cells</p>	<p>Light amplification, switching devices triggered by light waves, conversion of light to electricity.</p>	<p>Devices that turn the street lights on and off in your home town—triggered by the sun. They'll do it in your home, soon. They'll charge solar batteries to drive home appliances, too.</p>
<p><b>Electroluminescence:</b> Ability of a phosphor to emit light when stimulated by an a.c. current.</p>	<p>Electroluminescent panels</p>	<p>Display for logic and memory circuits; light amplification (when panel is backed by a photoconductive layer).</p>	<p>They'll make picture frame TV; home lighting elements of entire walls, ceilings, floors, draperies. Light intensity and color can be controlled. Panels will also heat and cool your house.</p>
<p><b>Molecular Resonance:</b> Ability of certain materials to produce monochromatic light beams that may be modulated.</p>	<p>Masers</p> <p>Lasers</p> <p>Irasers</p>	<p>Radio microwave, infrared and light-wave amplification.</p>	<p>Tomorrow's communications — on light-wave frequencies. Experiments indicate that a single Laser beam can carry more than a million TV channels. Spread of beam would make a mere 100-mile circle on the surface of the moon. Will likely be basis for space communications.</p>
<p><b>Ferromagnetism:</b> Ability of certain crystals to remain magnetized after a magnetic field has been applied and removed.</p>	<p>Thin-film memories.</p> <p>Logic elements.</p> <p>Multiple aperture cores.</p>	<p>Computer memories.</p> <p>Permanent-magnet applications.</p>	<p>Higher-speed computers capable of storing more information and providing instantaneous responses resembling human thought and judgment.</p>
<p><b>Ferroelectrics:</b> Ability of certain crystals to polarize and remain magnetic, after an electric field has been applied and removed.</p>	<p>Experimental logic and memory devices.</p> <p>Dielectric amplifiers, modulators.</p>		
<p><b>Piezoelectrics:</b> Ability of certain crystals to generate an electric voltage when squeezed, bent or twisted.</p>	<p>Transducers</p> <p>Strain-gauge generators</p>	<p>Controlling, measuring, transduction.</p>	<p>Long-known phenomenon used in microphones, phonograph pickups, sonar, depth finding. Newer applications: noise-free narrow band wave filters.</p>
<p><b>Thermoelectrics:</b></p> <p><b>Seebeck effect:</b> Electrical voltage generated when two dissimilar materials are joined and junctions are held at different temperatures.</p> <p><b>Peltier effect:</b> Ability of an electric current, when passed through a closed circuit of two dissimilar materials, to heat one junction and cool the other.</p>	<p>Thermoelectric generators.</p> <p>Thermionic converters.</p> <p>Plasma diodes</p>	<p>Direct conversion of heat to electricity.</p> <p>Refrigeration.</p> <p>Heating.</p>	<p>Baby bottlewarmers, drink chillers, small refrigeration units. Coming up are gadgets powered with a tiny gas or oil-fueled flame, that will provide electrical power to run a lawn mower, generate power to light a cabin in the woods, pull industrial quantities of electricity from the heat of atomic piles.</p>
<p><b>Superconductivity:</b> Ability of certain materials to lose electrical resistance when cooled to near absolute zero.</p>	<p>Cryotrons</p>	<p>Making microcircuitry ultra-high-speed and noise-free.</p>	<p>From liquid-hydrogen-cooled solid state loops will come ultra-high-speed computer circuits, noise-free radios, tiny electromagnets capable of lifting tons.</p>





**LASER** research: A synthetic ruby crystal is tried in a wave guide component to add power to fantastic beam

transistor radios powered by electricity derived from your own body heat. There's already a boat powered by an electric outboard that gets its juice from a tiny gas flame.

Using a new and revolutionary kind of compact beam that operates like radar, scientists at Hughes Aircraft Corp. in Culver City, Calif., can study the flaws in screwheads and bolts on kitchen tables and wheelbarrows seven miles away. Back East at Bell Laboratory's Murray Hill, N. J., plant, with the same device, physicists are vaporizing carbon at 7500 degrees F. in a millionth of a second and performing knifeless surgery on rabbits. They talk about using their fantastic beam to "spot weld" detached retinas in human eyes. At General Electric's Schenectady labs, experiments in steel welding and fine machining

with this same equipment are under way. The engineers tell you quietly that the beam can carry a million TV channels simultaneously at light-wave frequencies, and probably will provide tomorrow's communications through water, air and interstellar space. This is no pipe dream. The beam is available and waiting for development of materials and systems.

In electronics laboratories across the land there's an air of quiet excitement, a continual flow of reported breakthroughs and talk of things to come that would have qualified as pure science fiction only a few years ago. You hear about pea-size transmitter implants that will permit a doctor to tune in on one patient's heartbeat, or another's breathing rate, while he's making house calls two miles from the hospital. Men talk seriously about electronic brains



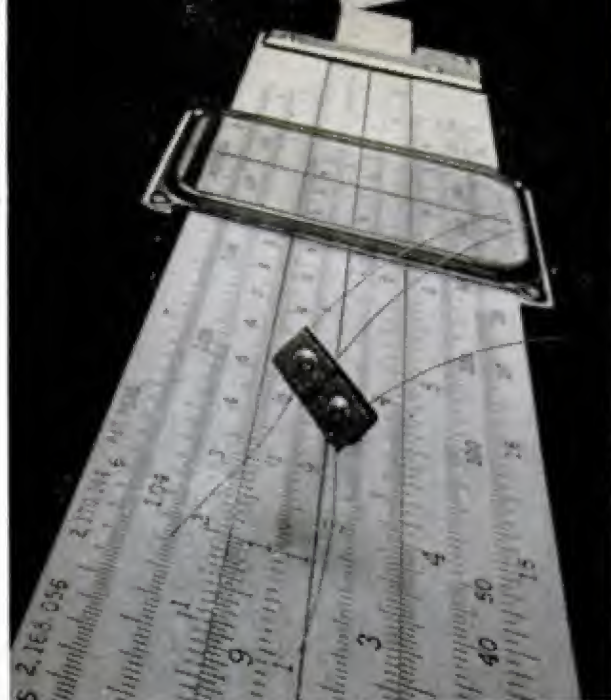
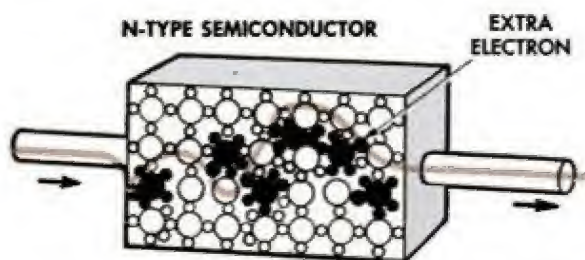


**ELECTRONIC PANEL** less than one-half inch thick uses principle of electroluminescence to produce image

that have reason, judgment and reaction to stimuli like sound, light, or pain. There's candid chatter about flat, picture-frame TV tubes, about walls and draperies that will provide home lighting, heating and cooling—all automatically controlled by outside conditions.

It's a way-out world of confusing semantics and the unfamiliar gobbledygook of a brand-new language. Eavesdrop on the coffee-time gossip in any electronics lab today and you'll get an earful of *notch filters*,

**PURE SEMICONDUCTOR** like silicon, with four electrons per atom, won't conduct. But if doped with five-electron impurity like arsenic, extra electron won't fit and wanders through crystal, acting as a negative carrier



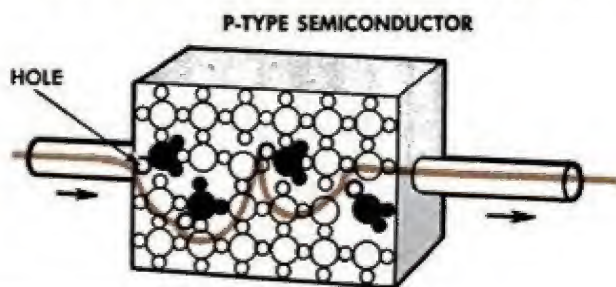
**SLIDE RULE.** Wafer of silicon multiplies and divides in same basic way as does larger, conventional rule

*nanoseconds, nor-gates, multistage flip-flops, half adders, masers, lasers and irasers.* You'll hear about *holes*, which turn out to be electrons that aren't there; and the *n* and *p* materials, that are the heart of much of this strange business.

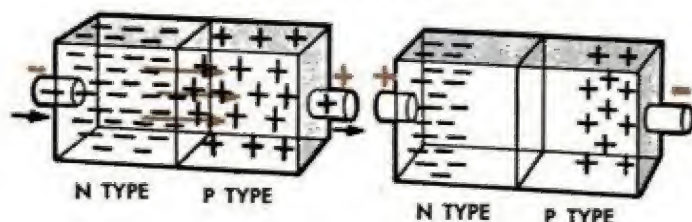
All of the newly projected wonders have suddenly become genuine probabilities, due to the wildfire growth of a Hydra-headed science, known commonly as solid-state physics. Actually, this is a misnomer. Solid-

(Continued to page 222)

**BY DOPING** silicon crystals with a three-electron impurity like aluminum, holes equal to positive charges are left in crystal lattice. Electrons jumping from hole to hole can then carry current through crystal

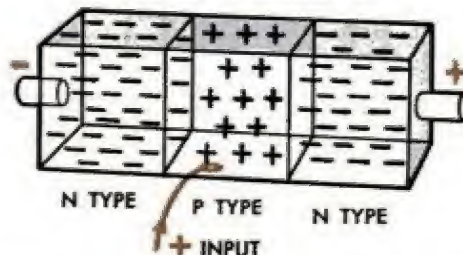


**WHAT IS A DIODE?**



**NEGATIVE CURRENT**, left, repels electrons in *n* region, pushes them to *p* region completing circuitry. Right: If current is reversed, charges in the wires attract opposite ones in crystal, creating circuit breaking void at junction. So diode is one-way electrical gate

**WHAT IS A TRANSISTOR?**



**N AND P** forces prevent current flow in a transistor at rest. But when triggered by a tiny plus charge, main current electrons are attracted through barriers. En route they absorb control current characteristics and boost it. Result is that transistor is an amplifier



# AUTO REVIEW FOR '62

On the following pages Popular Mechanics presents under-the-hood and behind-the-wheel reports on the '62 models. These reports answer some pointed questions:

**Drive-Comparing the Ford Fairlane, Chevy II and the new slimmed-down Plymouth . . .** How do these three popular makes stack up on performance, economy and comfort?

**A Serviceman Looks at the '62s . . .** What are the out-of-sight advantages or thoughtless boo-boos which will make a mechanic happy or unhappy (and charge accordingly!)? Do the new maintenance-free features live up to their billing?

**An Engineer Analyzes the '62s . . .** What is truly **all-new** about the new models? What innovations and improvements in engines, suspensions, transmissions, brakes have the '62s introduced, and what will these improvements mean to you?

**Those Dreams Detroit Built—Have They Really Changed Your Car? . . .** Were yesterday's cars-of-tomorrow publicity pipe dreams? Have they really influenced the design of today's cars? Here's a fascinating pictorial review of the design trends.

**PM Tests Those New Metallic Brake Linings . . .** How do they compare with conventional linings when put through a tough series of tests? Here are some surprising answers.

**How to Save Safely on Car Insurance . . .** Are you getting all the discounts you're entitled to? How much can you reduce your yearly insurance costs? This rundown may tip you off to substantial savings.

**Pressure Caps and Thermostats . . .** How do they affect the efficiency of your car, winter and summer?

You'll find answers to these questions — and more — in this special "Auto Review for '62."

## READY-TO-FRAME REPRINTS AVAILABLE

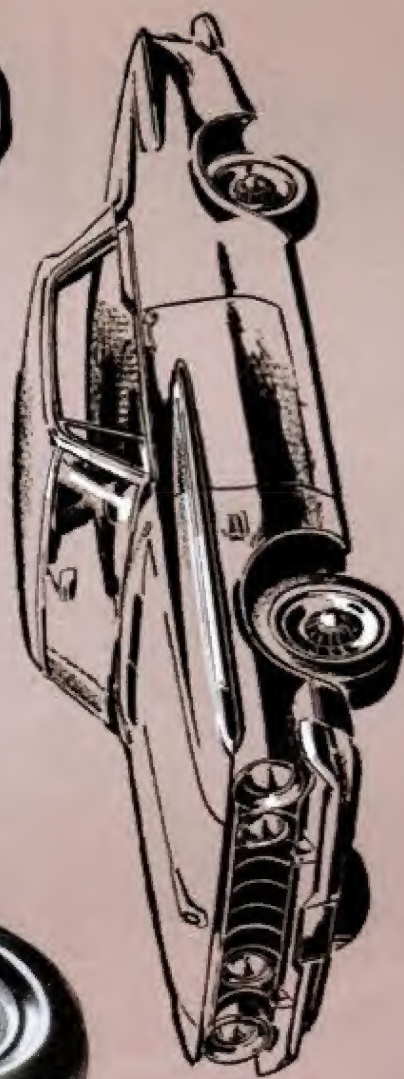
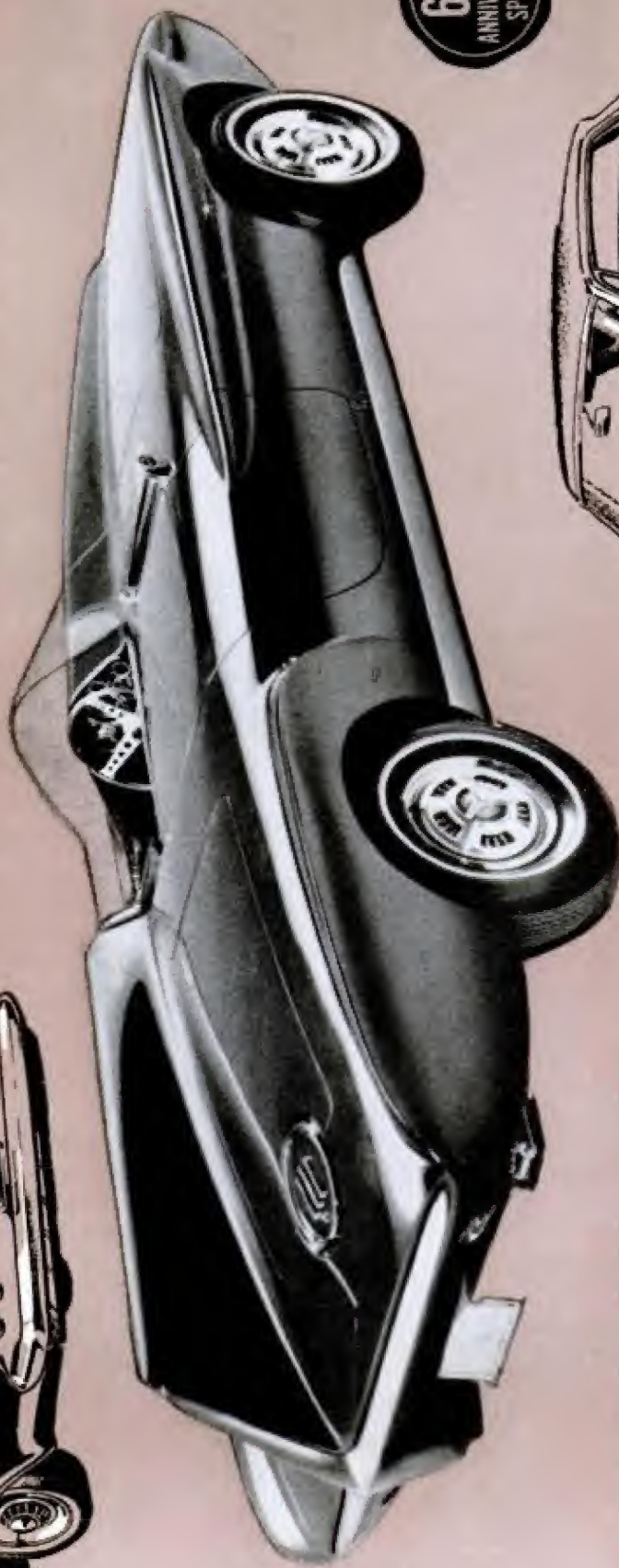
Reprints of the complete set of dream cars shown on the following pages are available as long as the supply lasts. Send 25 cents to Service Bureau, Dept. 62R, Popular Mechanics, 200 E. Ontario St., Chicago 11, Ill.

## SPECIFICATION CHART REPRINTS

Additional copies of the auto specifications chart on the cover of this issue can be obtained by sending 25 cents to Service Bureau, Dept. SC, Popular Mechanics, 200 E. Ontario St., Chicago 11, Ill.



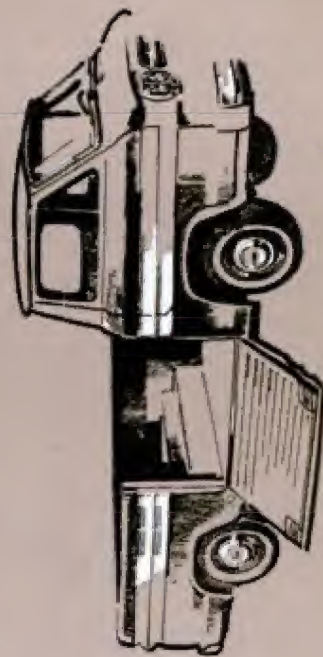
# Those Dreams Detroit Built— Have They Really Changed Your Car?



## PLYMOUTH XNR

Chrysler Corporation gave us a preview of major styling themes to come with the Plymouth XNR sports car introduced in the winter of 1960. Its sloping hood and "wingtip" front fender lines are seen in '62 Plymouth's front, right, while the horizontal and vertical bumper-fin theme appears, above, on its rear deck.





## GM L'UNIVERSELLE

Corvair's Greenbrier station wagon of 1961-62 was foreshadowed by the GMC L'Universelle, a dream truck unveiled in 1955. Its folding-door idea appears on Corvair's Rampside pickup, right. With a forward-mounted V8 of 180 horsepower, it is 188 inches long.



# FORD X-100



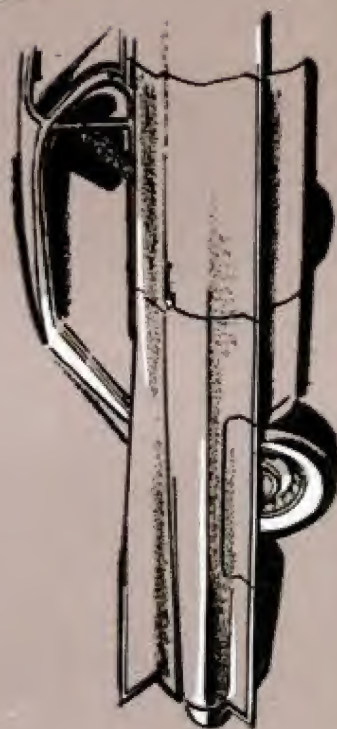
Ford's X-100 was introduced at the Paris Auto Show in 1953. It is 220 inches long, weighs 5900 pounds, seats six. Its sleek lines influenced design of many Ford products. Most striking comparison is with the 1961-62 Thunderbird, right. Hood scoop turned up on the '58 Ford, shown at top.



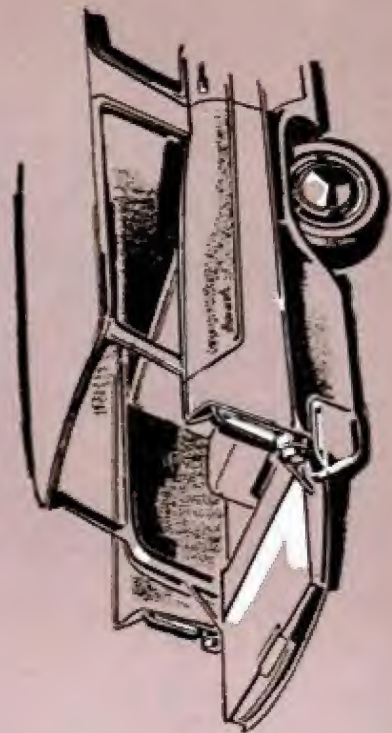
# CADILLAC CYCLONE



Here we see a reverse twist. The production Cadillacs of 1955-56, top right, influenced the Cyclone dream car of 1959 with its torpedonosed bumpers which contained guidance radar. However, its rear-quarter styling with the low rub-rail fin and shark-like dorsal fin previewed the lines of the '61 Cadillac, lower left.



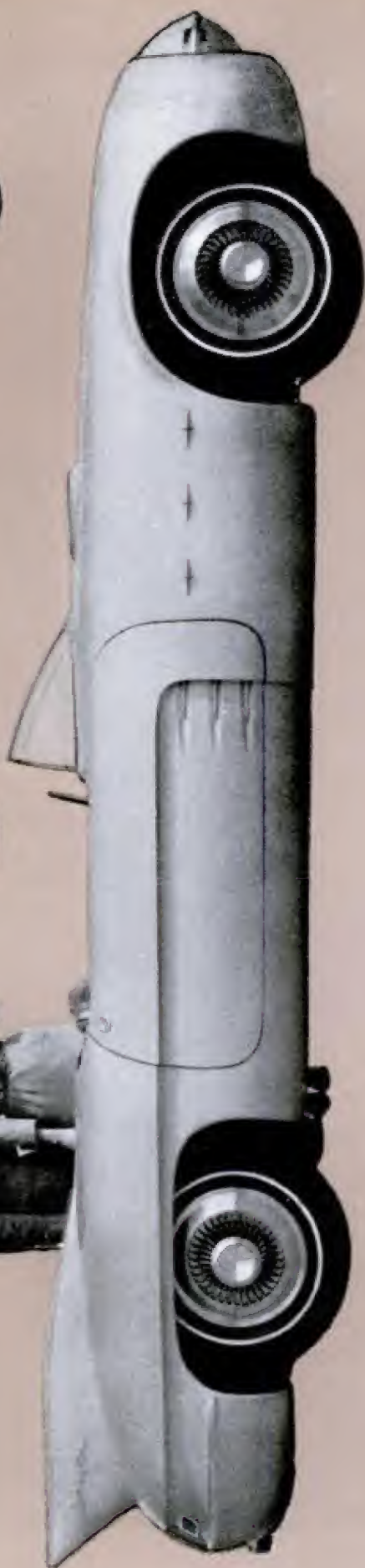




## PLYMOUTH PLAINSMAN

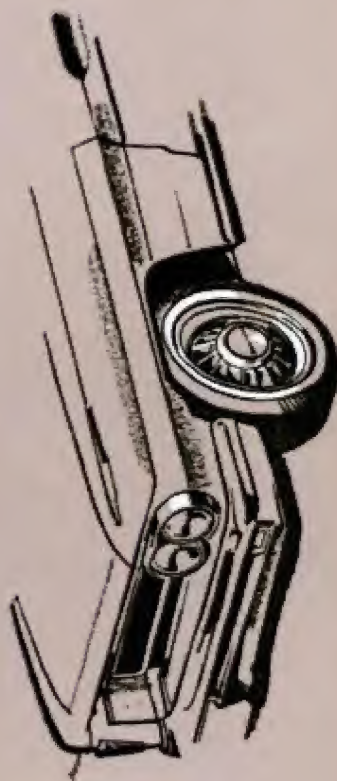
The Plainsman, an "idea station wagon," first shown in 1956, offered the public a chance to prejudice features that appeared later on Plymouth and other Chrysler wagons, such as rearward-facing third seat on '58 Plymouth, left, slanted, cantilevered pillar of roof, top right, and in-fender spare tire stowage on Plymouth's wagon.





## PONTIAC CLUB de MER

Club de Mer, Pontiac's dream car of 1956, was this sports roadster with body of brushed aluminum. It gave a dominant styling theme, the sculptured recess in the side panel adorned with three chrome windspits, to the Tempest, above, while similar aluminum wheels show up as an option on '62 Pontiac Bonneville, at left.



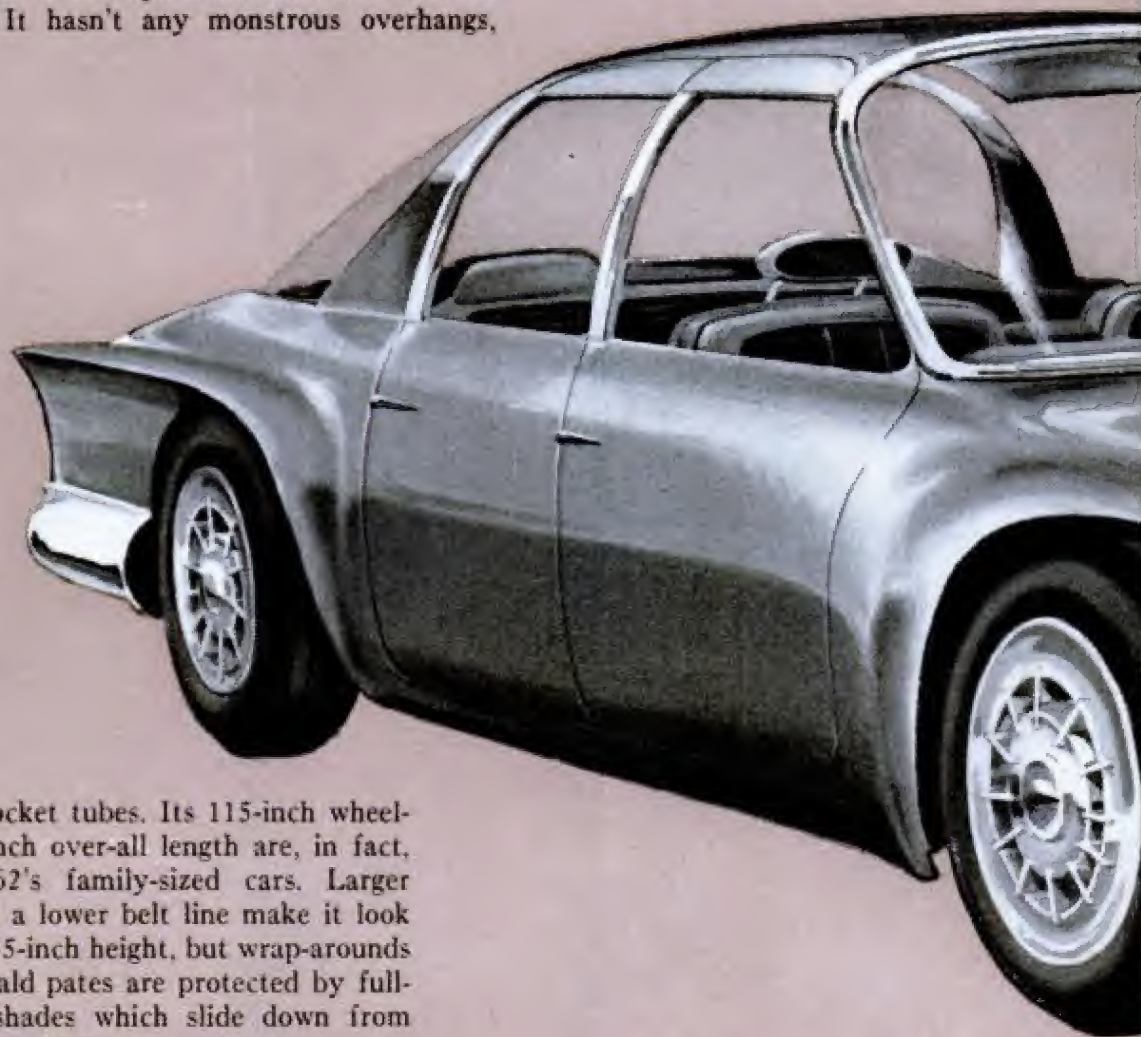


# This Could Be Your 1967 Car

PM's own dream car, the PM 67, gets a strong assist from two General Motor's dream cars shown on the opposite page.

Its curved aerodynamic shape provides a needed psychological change from today's sculptured breadboxes. It also produces real fuel savings at 80 m.p.h. superhighway cruising speeds.

Note, also, that the PM 67 represents a more practical form of aerodynamics than GM's earlier dream cars. It hasn't any monstrous overhangs,



shark fins or rocket tubes. Its 115-inch wheelbase and 190-inch over-all length are, in fact, similar to 1962's family-sized cars. Larger glass areas and a lower belt line make it look lower than its 55-inch height, but wrap-arounds are mild and bald pates are protected by full-width plastic shades which slide down from pockets on the roof liner.

Large, aluminum wheels in full view give car a feeling of purposeful power no tail fin could equal. A cushioned, upright center guard (remember the wartime Jeep's "wirecutters"?) protects the grille.

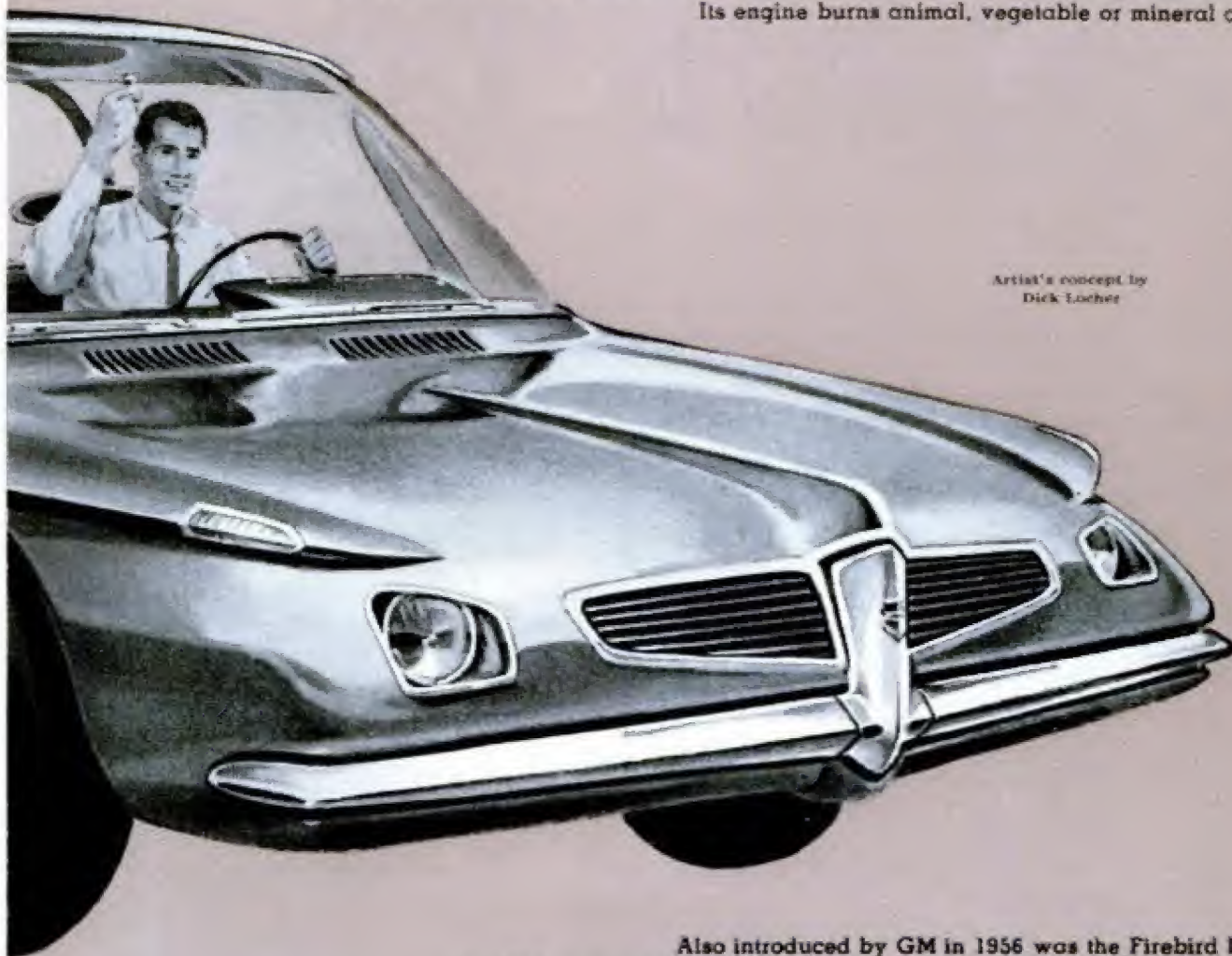
Hinged panels that flip up above the doors make the PM 67 easy to enter. Spectacular weight savings on this 2200-lb. car stem from using body panels made of honeycombed aluminum foil resin-bonded between metal or glass fiber sheets. Doors are only three inches thick, permitting 62-inch seats within 70-inch width.

The front-mounted power plant is a V6 precision cast of iron and short enough to permit moving seats forward, centering them between the axles for greater legroom. Wider, shorter, slanted radiator and horizontal carburetor permits hood to be low. The engine weighs 300 pounds and develops 150 horsepower to drive the car through a rear transaxle. Suspension is independent by torsion bars, with driver able to select "soft boulevard" or firm "sports car" ride by changing shock absorber settings while under way.





GM's XP-500, an experimental free-piston powered car was unveiled in 1956. Its engine burns animal, vegetable or mineral oil



Artist's concept by  
Dick Locher

Also introduced by GM in 1956 was the Firebird II, first U.S. gas turbine-powered car suitable for actual highway usage





DO NOT FURNISH AUTHOR'S NAME  
AND ADDRESS TO ANYONE — (per Editorial)



# A Serviceman

## Looks at the '62s

**SOILED CLOTHES** are not the price of carrying out routine service checks on new Chevy II; battery, radiator cap, transmission dipstick, power steering, brake fluid and washer fillers are easily reached

*The author of this article is a well-known expert in the automotive service field who prefers to remain anonymous and thus be free to levy criticism at the industry where it may be deserved.*

**WITH FEW** exceptions U.S. automakers are making real attempts to ease the problems of servicing by reducing the time, money and aggravation involved in routine upkeep.

The reason for this is that car manufacturers have run into a heavy groundswell of owner dissatisfaction with the rising cost of car maintenance. This hurts the manu-

facturer because the more the owner is compelled to spend on maintenance of his current car the less money he has to put into a new car.

Also, there's a sizeable competitive advantage in a car that's easier to service, or better yet, needs practically no service at all.

Freedom from service worries has become as important a selling point as driving ease or luggage space.

Automakers are taking three routes to eliminating service problems: 1) They are making service operations more accessible, therefore quicker (and cheaper); 2) they

**CHRYSLERS OFFER** improved servicing of the electrical system by moving the fuse box inside the glove compartment (left). The Chrysler line, like all 1962 cars of the Chrysler Corporation, is also equipped with the new foolproof disconnect for under-hood circuits (right) that plugs right into the fire wall







are lengthening the interval between routine service operations; 3) they are eliminating the service operation altogether.

The new '62 compacts have increased the industry's record of service accessibility, especially in the engine compartments.

Chevy II Four and Six sit straight up under their hoods and all accessories are easy to get to and work on. Ford's Fairlane and Mercury's Meteor have Sixes with good accessibility and modern V8s with carburetors, distributors and fuel filters up top and out front.

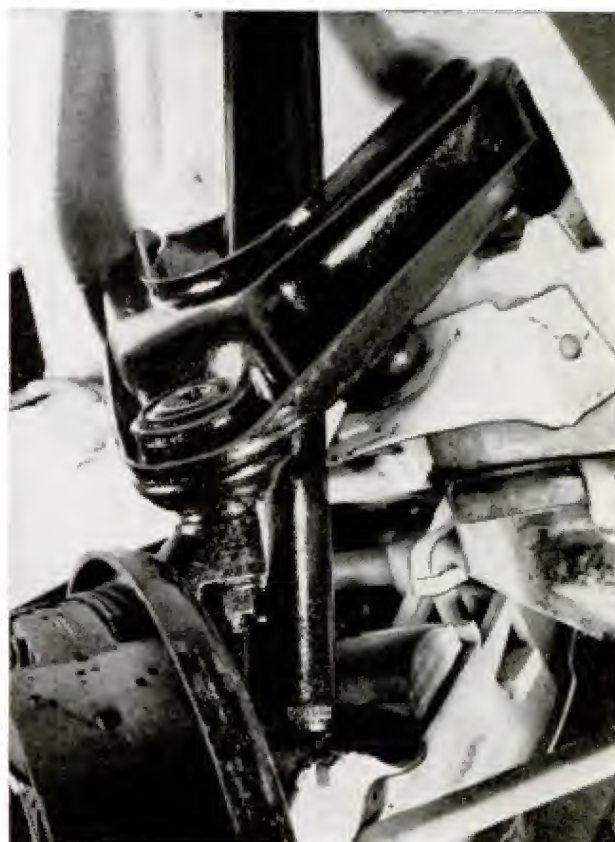
Older compacts like Rambler, Lark, Falcon and Comet also have "straight up" Sixes with accessible components. Lighter compacts and "family-sized cars" have permitted elimination of power steering, power brakes and other accessories. Even convertibles on Chevy II, Buick Special and Olds F-85 offer manually-operated tops where a trouble-free counterbalance spring takes the place of complicated electric and hydraulic systems with their potential service problems.

Even in bigger cars, service is becoming easier. Any mechanic who has adjusted breaker points on a recent Buick V8 will breathe a sigh of relief when he sees that the distributor, formerly smack up against the firewall, now has a clearance of several inches as a result of this year's movement of the engine toward the front of the chassis. In the same car, the entire top of the instrument panel can be taken out after removing four screws.

Chrysler gets rid of the rat's nest of wires under the dash by joining the trend to printed circuits. Quick disconnects separate the electrical circuits at the firewall, eliminating tedious tracing and threading of individual wires.

Chrysler cars have moved the fuse box up into the glove compartment for the ultimate in ease of replacement. Plymouth, Dodge, Valiant and Lancer not only have printed circuits for instrument-panel wiring but the panels can be detached for bulb replacement by undoing four screws from the front. The entire front end of the Chevy II bolts to the body structure, simplifying damage repair.

Dodge and Plymouth have created a minor problem by lowering the engine to drop the center of gravity and cut the size of the transmission tunnel. This change



**SEALED FITTINGS** on the steering linkage tie rods of '62 Chrysler Corp. cars (see top) have no filler plugs and never need checking unless seals are damaged. Ball joints on Chrysler products are the only suspension fittings to be serviced (above) via filler plugs, and then only at 32,000-mile intervals

**NEW YORK TAXI** fleet using Fords with 30,000-mile suspension and steering lubrication has cut service intervals to 10,000 miles, installed grease fittings







A BRAND-NEW CAR with a choice of two V8 engines, as well as a Six, the '62 Dodge has an accessible distributor but the spark plugs, hidden beneath the hot exhaust manifolds, present a real problem

## PM'S 1962 SERVICE CHECK-LIST

MAKE	Change Engine Oil	Change Oil Filter	Lubricate Chassis	Change Automatic Transmission Fluid	Change Rear Axle and Manual Transmission	Change Coolant	Change Gasoline Filter	Adjust Brakes
<b>AMERICAN MOTORS</b>								
Rambler American	4000	4000	2000	25,000	Perm.	2 yrs.	N.A.	Self Adj.
Rambler Classic	4000	4000	33,000	25,000	Perm.	2 yrs.	N.A.	Self Adj.
Rambler Ambassador	4000	4000	33,000	25,000	Perm.	2 yrs.	N.A.	Self Adj.
<b>CHRYSLER CORP.</b>								
All models	4000	4000	32,000	32,000	32,000	Seasonal	32,000	****
<b>FORD MOTOR COMPANY</b>								
Falcon	4000	4000	1000	24,000	24,000	2 yrs.	6000	24,000
Comet	6000	6000	1000	**	**	2 yrs.	6000	Self adj.
Thunderbird	6000	6000	6000	**	**	2 yrs.	30,000	Self adj.
Continental	6000	6000	30,000	**	**	2 yrs.	12,000	Self adj.
All others	6000	6000	30,000	**	**	2 yrs.	30,000	Self adj.
<b>GENERAL MOTORS CORP.</b>								
Corvair	60 days or 4000	60 days or 4000	1000	**	**	—	N.A.	Periodic
Tempest	"	6 mos. or 4000	4000	**	**	Seasonal	12,000	"
Buick Special	"	8000	1000	25,000	**	"	N.A.	"
F-85	"	6 mos. or 4000	2000	24,000	**	"	Periodic	"
Chevy II	"	"	1000	**	**	"	N.A.	"
Chevrolet	"	"	1000	**	**	"	N.A.	"
Corvette	"	"	1000	**	**	"	N.A.	"
Pontiac	"	"	35,000	25,000	**	"	12,000	"
Oldsmobile	"	"	*	24,000	**	"	Periodic	"
Buick	"	8000	1000	25,000	**	"	N.A.	"
Cadillac	"	6 mos. or 4000	*	16,000	**	"	6 mos.	Self adj.
<b>STUDEBAKER-PACKARD</b>								
All models	2500-3000	5000	1000	15,000	10,000	"	Periodic	Periodic

\* Does not require periodic lubrication.

\*\* No periodic drain recommended.

\*\*\* No periodic drain for differential.

\*\*\*\* Self-adjusting brakes on Dodge Dart, Polaras; Plymouths; adjust others when needed.

N.A.—Information not available.

MOST MAKERS ADVISE INSPECTION AND MINOR LUBRICATION AT 4000-6000-MILE INTERVALS



doesn't ease the already difficult job of changing plugs in the 361-cu.-in. V8.

Buick's V6 is easy to work on but holds a couple of surprises. The fuel filter is simple to change, once you've found it in the carburetor float-chamber inlet. An oscilloscope hooked up to this engine shows unevenly spaced cylinder patterns, the result of unequal firing intervals of 90 and 150 degrees. This means that a perfectly-tuned ignition system is an absolute must for smooth running.

The number of cars equipped with mechanically simple, service-minimum manual chokes has increased with Fairlane Six, Mercury Meteor Six, Falcon, Chevy II Four, and Tempest manual transmission using them.

Tire changing is just about as tedious as ever but the switch to cable control of rear brakes for parking on Dodge and Plymouth ends the annoying and dangerous business of the car rolling out from under the jack.

Nobody has yet come out with convenient jacking sockets such as are found on European cars, and a couple of cars like Tempest and Corvair require the unhappy motorist to locate a "dimple" on the underside of the body sill for jacking the rear of the car.

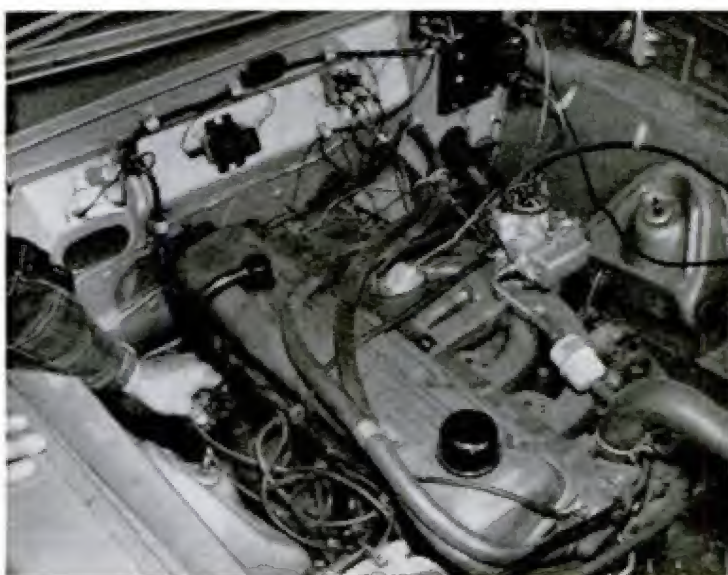
With the exception of Buick, Chevrolet and Studebaker, all manufacturers offer cars which need no chassis lubrication for 30,000 miles or more. Oil-drain periods have been stretched to 6000 miles in Ford products and 4000 miles for most other cars. Ford and American Motors offer factory-fill coolant which can be left in the system for two years. Self-adjusting brakes appear on more makes this year.

These service-free features save time and money for the owner who is willing to follow the manufacturer's recommendations concerning minor lubrication (wheel bearings, U-joints, by-pass valve etc.) and inspection at 4000 to 6000-mile intervals. But the motorist who thinks he can bid a cheerful goodbye to the grease rack for 30,000 miles is just asking for a big repair bill at some future date.

(Continued to page 232)



**FAIRLANE AND METEOR SIXES** are very accessible. Oil filter can be reached from topside, spark plugs are at hand. There's plenty of wrench and wrist room around distributor and fuel pump



**PLYMOUTH SLANT SIX** doesn't foil spark-plug changers, but a tune-up man or Saturday mechanic will find that servicing the distributor or the oil filter is a knuckle-busting chore



**CHEVY II SIX** (above) and Four, like the Fairlane, are Saturday serviceman's delight. Hand is on the oil filter cartridge near easily-tuned distributor and easy-to-reach fuel pump



# Drive Comparing

By Jim Whipple

**I**T MAY COST YOU 32 cents more for fuel to drive a 1962 Plymouth Six over a 168-mile route than to make the identical run in a four-cylinder Chevy II. Fuel expenses for a Ford Fairlane making the same trip may be 10 cents less than the Plymouth, 22 cents more than the Chevy II's. Those were two things PM learned in the course of a comparison test of three new U.S. economy cars.

The cars were: a Plymouth Belvedere four-door sedan with six-cylinder, 145-horsepower engine and automatic transmission; a Ford Fairlane two-door, with 101-horsepower six-cylinder engine and manual transmission; and a four-door Chevy II sedan with four-cylinder engine, manual transmission and (of all things) power

## DATA ON PM'S THREE TEST CARS

	Weight	Displacement (Cu. in.)	Horsepower	Axle Ratio
Plymouth Six	3172	225	145	2.93:1
Fairlane Six	2854	170	101	3.50:1
Chevy II Four	2557	153	90	3.08:1

steering and power brakes. Neither the Plymouth nor the Ford had power-assisted steering or brakes. The Plymouth's automatic transmission may have added to its fuel bill.

The cars were driven for over 500 miles by several PM staff members under various road and traffic conditions. The main event however, was a 168-mile reliability run in which all three cars followed one another with drivers switching back and forth every 30 to 40 miles.

The route was varied, with 48 miles of turnpike driving at 65 to 70 m.p.h., 29 miles of city driving at 20-25 m.p.h., 28 miles of paved country roads at 40-45 m.p.h., and 63 miles of concrete highway at 60-65 m.p.h.

At the start, odometer readings varied as follows: Plymouth 173.4 miles, Chevy II 169.7 miles and Ford Fairlane 200.2 miles.

All three cars were carefully topped off with fuel at the beginning of the run and refilled and

**FAIRLANE'S TRIPLE-DIAL** cluster, top, is down under the top of the dash panel and doesn't feed light back into windshield at night. Best of the three is Plymouth's efficient instrumentation, center, with a huge, easily-read speedometer. Chevy II's panel, shown in bottom photo, has a speedometer, a fuel gauge and five indicator lights

Ford Fairlane ..  
Plymouth .....  
Chevy II .....





*.....a roomy, solid, practical family car*  
*.....a powerful Six with a quiet, soft ride*  
*.....a true compact with a spacious body*



**FORD FAIRLANE**



**PLYMOUTH**



**CHEVY II**



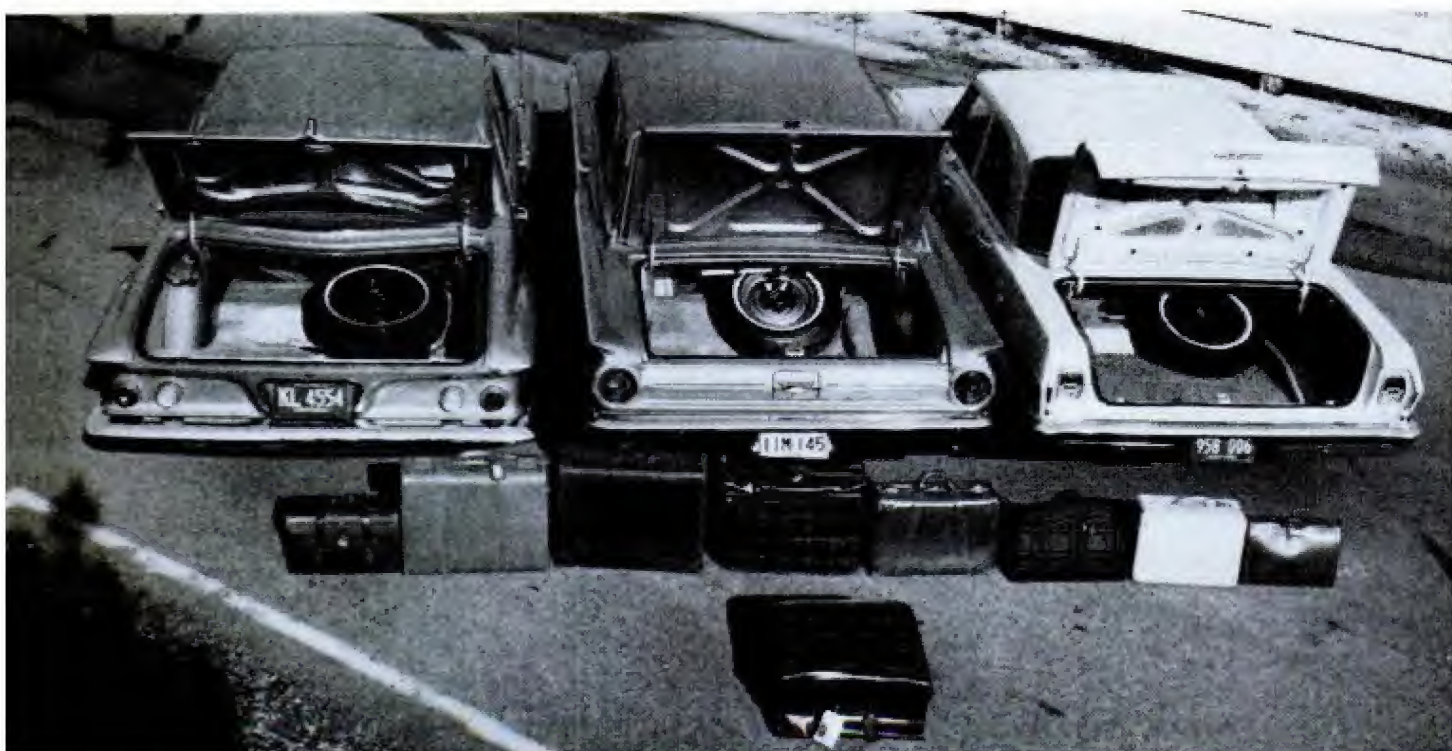


**PLYMOUTH'S SLOPING HOOD** stands out when parked between high, boxy Fairlane, right, and compromise angled, shorter hood of Chevy II. Ground clearance is about equal but for 5½-inch height of Chevy II's tie rods



**HERE'S THE SIZE STORY:** Chevy II, left, is a compact, 183 inches long as compared to Plymouth's 202-inch length, center. Fairlane is 197 inches in over-all length. Chevy II has a shorter rear deck and hood

**ALL OF THE BAGS SHOWN** above were packed into the trunks of both the Plymouth, left, and the Fairlane, center. Chevy II's trunk, right, held all the baggage except the large suitcase shown in the foreground





**LINE OF SIGHT** comparison on all three cars was made by measuring distance of driver's eyes from roof and windshield, setting camera's lens in exactly the same location, then sighting over edge of hood or trunk, moving the object until it was fully visible. This gave distance of object from car at ground level. Distances A and B, below left, give length of "blind" areas in front of and behind cars that drivers miss



#### FORD

A = 24'-8" B = 22'-10"

#### CHEVY II

A = 16'-10" B = 22'-8"

#### PLYMOUTH

A = 19'-6" B = 20'-1"



topped at the same pump when the run was completed. Mileage was taken from Illinois state road maps and intracity mileage taken on Chevy II's near-accurate speedometer. Comparative miles per gallon and cost of fuel used were as follows:

Plymouth	20.0	miles per gallon,	\$2.92
Fairlane	20.49	miles per gallon,	\$2.82
Chevy II	22.55	miles per gallon,	\$2.60

Acceleration from 0-60 miles per hour with correction for speedometer error came out to 13.4 seconds for the Plymouth, 15.5 for the Fairlane and 16.5 for Chevy II.

There's a lot more to a car than just fuel economy and acceleration, so we've tried to evaluate all three cars from the viewpoints of several types of drivers on questions of comfort, high-speed driving, performance, riding qualities and driving ease.

#### PLYMOUTH

Everyone felt that the Plymouth was more than adequately roomy and very comfortable. Legroom was quite sufficient for 6'2" drivers with the seat moved fully back. The transmission tunnel in front and the drive-shaft tunnel in the rear were found not to be particularly annoying although their total absence would be preferred.

After driving the other cars, we were instantly aware of greater quietness of the Plymouth's well-insulated and well-sealed body with very low wind noise and well-muffled engine noise.

The car moves up to 70 m.p.h. very smoothly; you hardly know that it's going that fast. Manual steering is light and precise in action, although its higher ratio does call for more wheel winding. You do get a bit of wheel twist that requires correction when you pass a semitrailer at high speed.

Plymouth is a relaxing car to drive in traffic. Its three-speed-plus torque converter automatic transmission gives a smooth, quiet flow of power with no annoying surges or jerks around shift points.

One 5'7" driver remarked that the rear window was high, which made it impossible to see the sloping rear deck and judge the outline of the car when backing into parking spaces.

Plymouth's three-speed automatic was a delight in Rockford traffic and our drivers found no need for power steering.

Plymouth accelerates more quietly from a standstill due to the smoothness of the automatic transmission, a greater amount of sound deadening around the body, and a





**CHEVY II DOORS** are high and wide and seats are wide and comfortable. Kneeroom is below average



**REAR SEAT RAISED** well above floor in Fairlane makes seating comfortable. Tunnel is relatively low



**PLENTY OF KNEEROOM** for tall man in Plymouth with front seat halfway back. Headroom is also good

larger engine working with a lower axle ratio, i.e. turning more slowly.

Over rough pavement the ride is much "happier" than in either the Chevy II or the Ford Fairlane. You feel the bumps from tar strips or rough pavement, but there's less total disturbance to the body due probably to softer springs and a longer wheelbase.

Total impression of the Plymouth is of a "big-car" ride, whereas the ride is less than that on either the Chevy II or Ford Fairlane.

Instruments are extremely readable on the Plymouth. The well-positioned, big speedometer has white numerals on grey dial face. Because of the hood's slope, forward vision is as good on the Plymouth as the other two cars, even though the Plymouth hood is longer.

The windshield's upper edge is lower because its slope angle is greater. It has as much glass from bottom to top, but it seems shallower. There's a little distortion seen by the driver in the upper right hand corner of the Plymouth's windshield. Similar distortion doesn't show up in the Chevy II or Fairlane.

## CHEVY II

Immediately on changing to the Chevy II, from one of the other cars, we were conscious of a tighter, smaller angle between the seat back and seat bottom, which makes it quite uncomfortable for long-legged persons. The seat back is not tilted back far enough, or the seat cushion is tilted too far up.

This dumps the base of your spine down in the seat. The left leg isn't too uncomfortable, but the right leg is the problem. This wasn't as noticeable on the six-cylinder Chevy II Deluxe that we tried later.

At 60 m.p.h., the four-cylinder Chevy II comes close to the vibration-sound level of the compact sixes; in fact, few people can tell that it is a four in this speed range.

The body structure of Chevy II is solid and free from judder and shake; there's not much sympathetic vibration at higher speeds. Basically, Chevy II is a solid, sturdy car but it could use more insulation for the engine.

However, the noise level is no more obtrusive than the Fairlane standard Six. This is not so much a compliment to the Fairlane as a testimonial to Chevy II's soundproofing. A four-cylinder Pontiac Tempest tested a few days later was smoother and quieter than either the Chevy II Four or the Fairlane Six—a tribute to Tempest's engine mounts.

There's a welcome absence of wind roar on the Chevy II Four. Backstop testing on the Chevy II Six, we found wind noise a bit annoying and came to the conclusion that it must be a quality-control problem.

One of the drivers commented that the Chevy II Four vibrated in traffic and he had to use second gear a good deal at 20-25 m.p.h. to avoid annoying vibration of a lugging engine. A few days later, checking the stick-shift '62 Tempest with 110 hp. four-

(Continued to page 244)



# An Engineer Analyzes the '62s



By Roger Huntington, ASAE

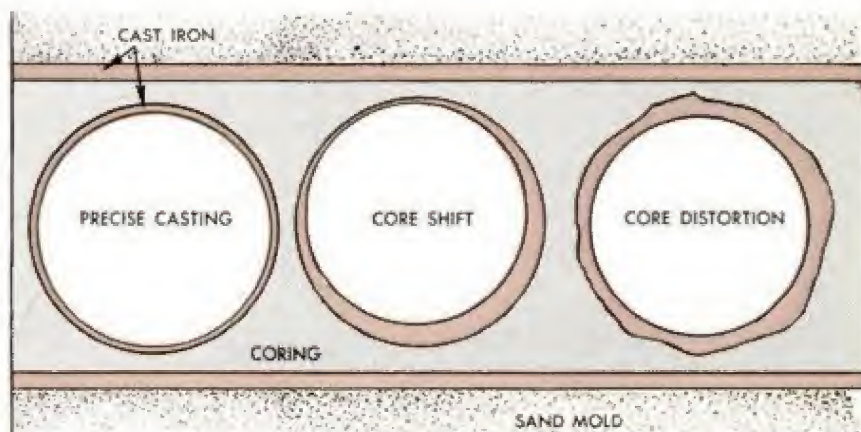
## ENGINES



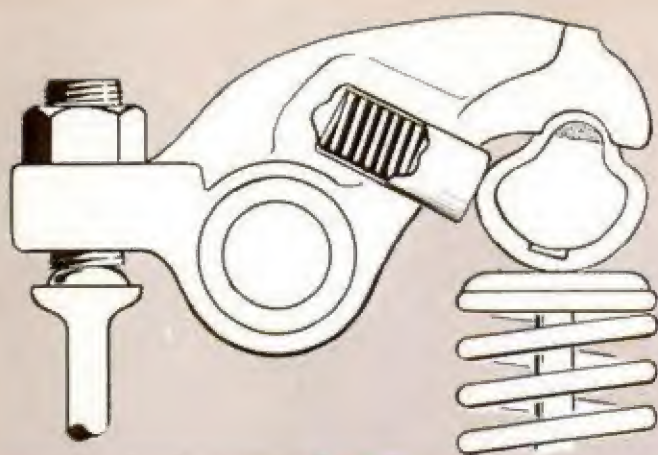
**F**OR TWO YEARS (1960-61) the big new feature in American car engines was aluminum construction, which was supposed to answer both cost and weight problems. At one time it looked as if no more new Detroit passenger car engines would be tooled for cast iron.

But in 1962 there are four brand-new engine designs—and they're *all* cast iron. There are the new in-line 4 and 6-cylinder engines for the Chevy II, Buick Special's new V6, and the small V8 for Ford Fairlane and Mercury Meteor. All are modern, up-to-date engines with plenty of advanced features; they'll give more performance in relation to fuel

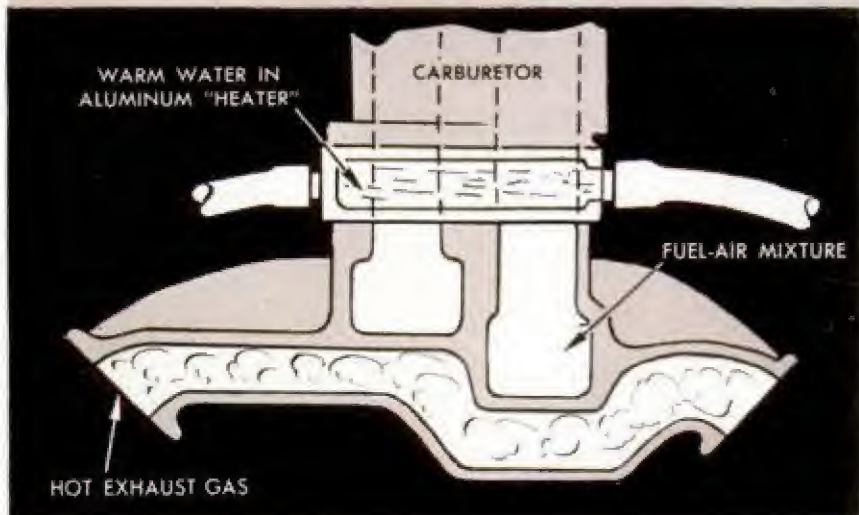
**CAST IRON "LIGHTWEIGHT"** engine is developed with solid coring composed of resin and sand that resist distortion and core shift formerly allowed for by making cylinder wall (and other parts) extra thick. This results in uniform wall, free from unneeded weight and uneven expansion or contraction



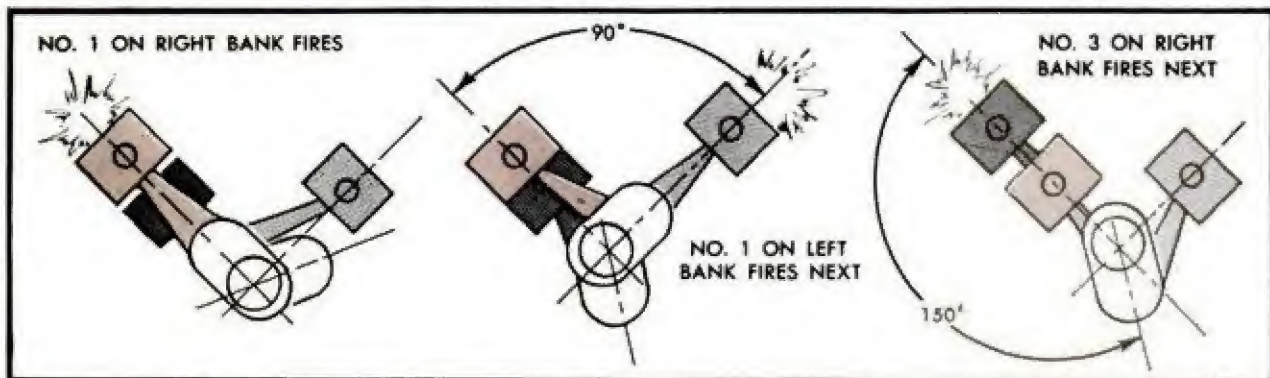




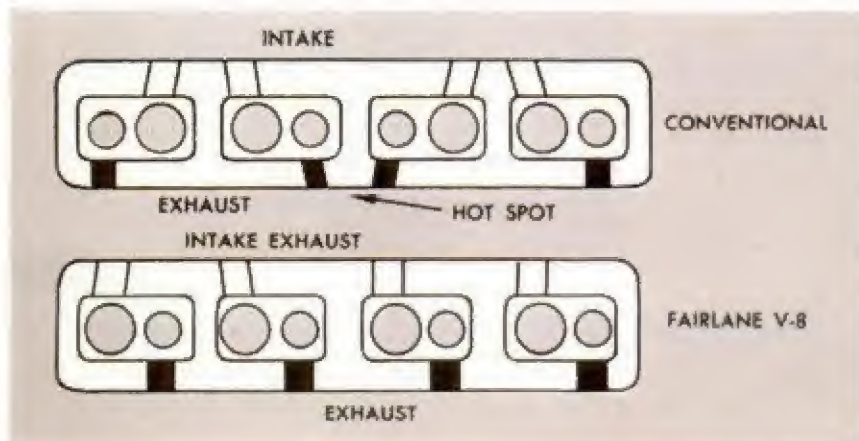
**FORD GALAXIE** and Mercury Monterey incorporate automatic zero-lash feature in their six-cylinder engines. It uses spring load plunger that keeps mushroom-shaped cam in constant contact with the valve stem



**TWO-WAY CONTROL** of incoming fuel mixture's temperature for Ford's Fairlane V8 is achieved by continuous flow of exhaust gases through crossover, and flow of warm water just below the carburetor throats

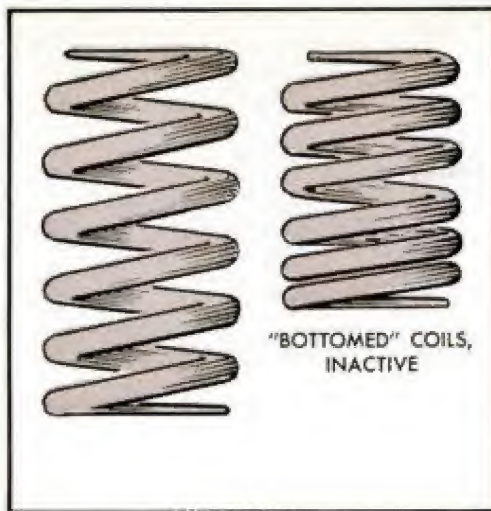


**UNIQUE FIRING PATTERN** used on Buick's new 90-degree V6 works successfully in spite of theoretical problem of uneven spacing between the firing impulses. Diagram is viewed as from front of car with odd numbers 1, 3, 5 on left bank and even numbers 2, 4, 6 on right bank. Thus firing order is 1, 6, 5, 4, 3, 2

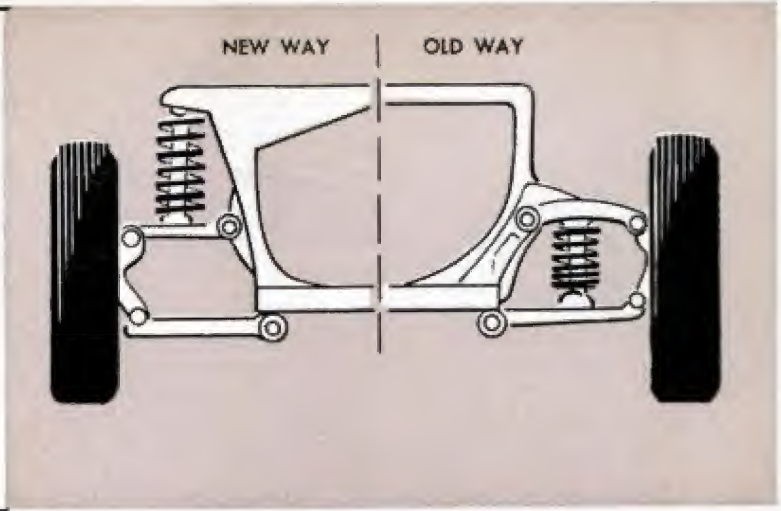


**SIAMESE PORTING** of second and third exhaust valves on conventional V8 cylinder head (top) creates a hot spot resulting in warping. Ford's Fairlane V8 cylinder head (below) avoids this with four, evenly-spaced ports





'62 BUICK SPECIAL'S variable pitch rear coils have low pitch end to "bottom" first, to stiffen against bumps



WIDER DISTRIBUTION of suspension loads reduces stress concentration when front coil springs are mounted above suspension arms on new unit bodies of the new Chevy II and Ford Fairlane

consumption, run smoother and last longer. And they're *light*. But they're still made of good old cast iron.

Aluminum engine production proved to be more expensive at the outset due to problems with porous castings, chilled hard spots, tool breakage, etc. All these items added to the greater cost of the metal itself didn't offer tremendous encouragement to the cost-conscious motormakers. These problems were solved but it took time and money. Then too, aluminum as a basic engine material seemed to work no sales magic with the public. As long as there was a light, economical car that performed satisfactorily the public didn't seem to care what the engine was made of.

But economy cars have got to be *light*. Not only do the automakers buy material by the pound, but it takes extra gas to lug dead weight. You can't put 600-pound engines in these cars.

Engine weight has always been a problem with cast-iron construction because the casting walls had to be made overly thick to allow for distortion and shifting of the internal cores, and to prevent too-sudden chilling of the molten iron flowing into the mold. In other words the head and cylinder block castings made were much heavier than strength requirements—just to allow for these casting bugs.

Detroit's answer was a revolutionary new foundry technique known generally as "thinwall casting." This new method includes using new plastic binders for core sand and quick-baking the cores at high temperature in preheated boxes to reduce distortion; or a one-piece core may be used where two or three pieces were used before, to reduce "core shift." Sand may be rammed into the mold with new hydraulic equipment to get a denser, more even mold

surface. New core coatings give smoother surfaces. There are new iron alloys for casting that are stronger, less brittle, and won't chill so suddenly in the mold.

All this means thinner casting walls without loss of strength—and head and cylinder block castings can be 15 to 30 percent lighter for a given size. For instance Buick's new cast iron V6 weighs less than 50 pounds more than their aluminum V8! Chevrolet's new six for the Chevy II is 150 lb. lighter than the old cast-iron six on the "big" car. Ford Fairlane's new V8, at 440 lb. with all accessories, runs about what Detroit figured aluminum engines would weigh a few years ago!

Chevrolet's new four and six-cylinder jobs for the Chevy II use valve gear, pistons, rods and bearings from the small 283-cu.in. Chevy V8. Both four and six are set up for machining on the same production lines and assembly on the same lines. Their layouts are very conventional in every way. These are undoubtedly the most inexpensive engines to produce in the industry. The Four has 153 cu.in. and puts out 90 hp.; the Six gets 120 hp. from 194 cu.in. Fuel economy and durability are excellent—and early road tests indicate unusual low-end torque and flexibility. The unusual bathtub-shaped combustion chambers are necessary in order to tilt the valves up at a straighter angle, so the push-rods can be put on the right side of the engine and all the intake and exhaust ports along the left side of the head (difficulties you run into when adapting V8 parts for in-line engines)!

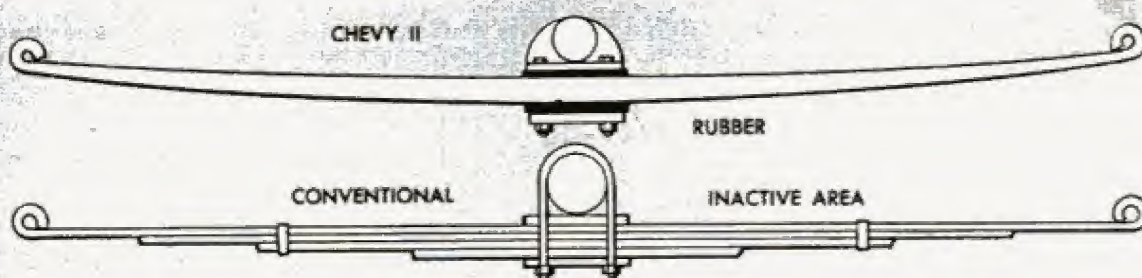
Buick engineers pulled off the quickest engine tooling job in the history of the U.S. auto industry when they got the new V6 into production within *five months* after the final decision to build it!





**HIGH BENDING STRESSES** of the new single-leaf spring as used in the new Chevy II, require the leaf to be thicker in the center than at the ends. Chevrolet reduces its production cost by rolling the leaf so that the material spreads out sideways as its thickness is compressed

**MULTILEAF SPRINGS** of the conventional type use more material than is actually necessary because the clamped-down center section does no work. Chevy II's new single-leaf spring is mounted in sliding rubber pads locked to a retaining clamp so the full length of the spring flexes



The top brass at Flint wanted to lower the Special line into the Ford-Chevrolet big six price bracket—and a new cast-iron six-cylinder engine was the only way they could do it.

Their answer was to chop the rear pair of cylinders off the aluminum V8 and cast the block and heads in iron. By using the V8 valve gear, die-cast aluminum front cover, accessories, timing chain and sprockets, water pump, oil pump, bearings—and by adapting a lot of the V8 tooling—Buick did the impossible.

Of course the textbook says you're not supposed to build a V6 layout with a 90-degree angle between the cylinder banks. In order to have evenly-spaced firing impulses you must use a 120-degree angle with a 3-throw crankshaft or a 60-degree angle with a 6-throw (see page 110). But Buick had to use the 90-degree angle in order to utilize V8 tooling. Answer: let the explosions come at odd intervals. You can't detect it above idling speed anyway.

On the new 90-degree V6 one explosion will follow the first after 90 degree of crankshaft rotation; then the next will come 150 degrees later—then 90 degrees, then 150 degrees, and so on. It's no problem at all.

Any V6 engine that doesn't use an auxiliary counterweight shaft running at twice crank speed will have a certain amount of secondary unbalance that will tend to shake the block. But, with the new 90-degree layout this shake is in a *crosswise* di-

rection—which is very easy to soak up with soft, flabby motor mounts. Buick is betting that you'll find their new V6 as smooth and silky as any Six you've ever driven. (Ed. note: We agree after testing. PM, Oct. '61, p. 109.)

And the performance is all you'll need in the 2800-lb. Special. With 198 cu.in., 8.8-to-1 compression ratio, and two-barrel carburetor feeding into the unique two-section manifold (where one carb barrel feeds each of the three cylinders on one bank at even 240-degree intervals of crank rotation). The speed and acceleration will be very adequate, yet you should get the fuel economy of a small Six.

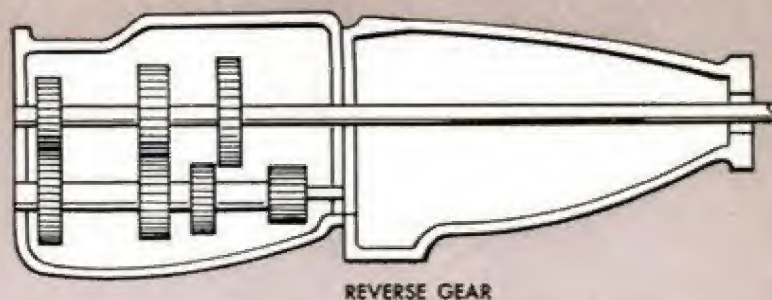
Ford's new 221-cu.in. V8 for the Fairlane and Meteor lines appears to combine most of the best features of all the industry V8s designed in the last 10 years. The bore is large in relation to stroke—giving lots of valve area, short connecting rods, and a very stiff lower end. We have big rod bearings and five huge mains. But Ford has abandoned the deep "Y-block" deal, where the block casting is brought down below the crankshaft. The added stiffness in the crankcase proved unnecessary—it was just a waste of metal.

Distributor and oil pump are driven off the front of the camshaft, for improved accessibility. The age-old wedge-shaped combustion chamber is used, as this still seems to give the best compromise between combustion smoothness, octane requirement and easy gas flow.



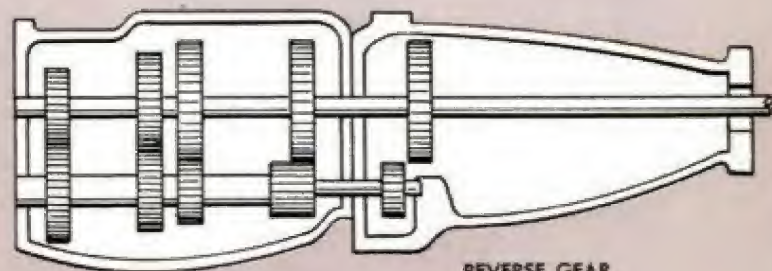
**ADDING A GEAR** to their conventional three-speed transmission is the way Borg-Warner made their new four-speed gearbox. Second gear takes over the place of low gear and the new low gear moves into the spot formerly occupied by reverse (both are constant-mesh synchro). Reverse gear is now located back in the tailshaft housing

ORIGINAL 3-SPEED



REVERSE GEAR

4-SPEED



REVERSE GEAR

One of the most interesting features of the new Ford engine is the ball-joint valve gear, patterned after the Chevrolet and Pontiac designs brought out in 1955. GM patents probably prevent a direct copy, so Ford casts its cup-shaped rocker arms instead of stamping them out of sheet steel. But Ford uses the same type of ball-joint rocker, stud and thin, hollow pushrod with oil coming up through it from the hydraulic tappet.

This is not only a relatively inexpensive valve gear (since separate rocker shafts and brackets are not required); but the low reciprocating weight allows higher r.p.m. without valve float. This valve gear may one day be an industry standard.

The claimed 143 hp. from 221 cu.in. on 8.7-to-1 compression ratio may be just a starting point for future development on this design.

As usual there are always a lot of interesting detail improvements on each year's engine crop. Buick's new cast-iron connecting rods for the V6 may start a trend. Rods take a beating, and engineers have usually insisted on making them of tough forged steel, like crankshafts. But forging is expensive. Ford has been casting cranks for years with great success. GM has done it too. Why not rods? New iron alloys are now available that are much stronger and less brittle than old conventional "gray iron," and yet can be cast cheaply with present equipment. Buick has been experimenting with cast con rods

for four years without major trouble. They'll all be using 'em tomorrow.

Most '62 Ford Motor Co. engines are using an interesting water-warmed aluminum "spacer" between intake manifold and carburetor. It acts as a thermal "shock absorber" to prevent sudden overheating of manifold and carb when full exhaust flow goes through the hot spot (which, in turn, can boil gas in the carb and coke oil on the underside of the manifold).

Ford engineers have also come up with a design for zero-lash mechanical valve lifters for the 223-cu.in. Six. A spring-loaded plunger in the rocker arm keeps tension on a swivel against the valve stem to maintain zero clearance—to get the same effect as hydraulic lifters with about half the cost. (This deal was supposed to come out on the 1961 models, but bugs held it back. It now looks like quite an important development.)

Some auto enthusiasts may have been disappointed that there weren't more radical developments in the '62 engine crop, comparable with the Buick-Olds aluminum V8 and Corvair air-cooled engines of recent years; but we must remember that the mass market wants *economy* these days . . . and this is what Detroit is trying to give it.

## TRANSMISSIONS

The recent trend to expensive, complicated, multiturbine torque converters has

(Continued to page 238)



# How to Save SAFELY on Car Insurance

by  
Harris  
Edward  
Dark



**I**NSURANCE AT A DISCOUNT? Sure, but not for everyone, and not automatically. You have to qualify and you have to ask for it.

For competitive reasons, there is a difference even in the basic rates of all insurance companies. One company's percentage of claims on certain coverages may be quite different from another's, and rates are based, generally, on experience.

Again for competitive reasons, some companies offer *special* rates (discounts) to certain kinds of drivers, to drivers who do certain kinds of driving and to those who drive certain kinds of vehicles.

Some of these discounts are new, and it would pay you to investigate them.

The idea, then, is to shop around among insurance companies and get the best combination of low basic rates and discounts. Here are a few of the available discounts:

**Good-Driver Plan**—A discount of about 20 per cent is offered to drivers who haven't had a chargeable accident (your fault, costing the insurance company \$50 or more) during the last five years (three years, say some companies). If later you do have a chargeable accident, your next annual premium may be higher; if you stay clean, you'll continue to enjoy the savings.

**Low-Mileage Discount**—You can save about 10 percent on your personal-liability and property-damage (PL & PD) coverage if you anticipate driving less than 7500 miles during the next year and so advise your agent when he writes or renews your

next policy. If you happen to drive more than 7500 miles during that term, the following year's premiums will be set accordingly. Some companies set the price break at 10,000 miles.

**Compact-Car Discount**—If your car is a compact, you can get a straight 10 percent discount on your liability (PL & PD), medical-payments and collision coverage. To qualify as a compact, your car must generally be a 1954 or later model, and must not exceed 3000 pounds, 200 inches over-all, 125 brake horsepower and a cost of \$2300 f.o.b. domestic or port of entry.

**Total-Abstainer Discount**—If no driver in your family ever uses alcoholic beverages, you can obtain your insurance for a 10 to 15 percent smaller premium from companies which specialize in insuring nondrinkers.

**Multiple-Car Discount**—If you own two or more cars, be sure to let the same company insure them. Your second or third car's premiums can be discounted as much as 25 percent.

**Pickup Truck Discount**—If you happen to be using a pickup truck primarily as a private conveyance, you can get insurance from some companies for almost 25 percent less than the same coverage on an auto.

**Trained-Driver Discount**—If you are, or have in your home, a teen-age boy driver, your insurance costs about three times as much as a lowest-rated adult. But there's a bright side. If a teen-age boy has completed an authorized driver-training course in a high school or recognized educational



institution of secondary or higher status, he can receive a discount of 15 percent from that high premium. Furthermore, if he reaches the age of 19 without having a chargeable accident, some companies will give him an additional discount. So if you're a 19-year-old or have one who is covered by your policy, check this with your agent.

**Safety-Belt Discount**—For several years many insurance companies granted a special discount to policyholders whose cars were equipped with safety belts. "Lack of response" caused this discount to be dropped. But watch for it to stage a comeback. Popularity of safety belts has suddenly catapulted, and companies out for business (that's all of them) may rush to restore the safety-belt discount.

These are some of the discounts available from some of the reputable insurance companies. Now, how do you find a reputable company? This, too, is important,



because doing business with one that is not so reputable might be the most expensive experience of your life. Here are some tips:

1. Check with your family, friends and neighbors, especially those who have entered claims. Ask whether they were satisfied with the kind of service they received after accidents.

2. If you are a newcomer and cannot consult with friends, check with the nearest Better Business Bureau. Their service is free and they will know the reputation, good or bad, of whatever agent or company you choose to do business with.

3. If you are still uneasy, contact the state division of insurance or the state insurance commission at your state capital. This agency can advise you whether your chosen company is in good standing.

4. If you buy insurance by mail, make sure the company you buy from is licensed to do business in your state. This way, you'll have the protection of the state insurance commission in case of dispute.

5. Most experts particularly advise

## Step-by-Step Saving

A typical policyholder might have an insurance setup like this:

Personal-liability coverage, \$25,000 per person and \$100,000 per accident; property-damage coverage, \$10,000; medical-payments coverage, \$2,000; collision coverage, \$50 deductible; comprehensive (fire, theft, windstorm, vandalism, glass breakage), coverage of actual cash value of damage.

### Rates thus:

\$25/100,000 PL .....	\$ 53.10
\$10,000 PD .....	15.20
\$2,000 medical .....	11.00
\$50 deductible .....	36.00
Comprehensive .....	14.00
	<b>\$129.30</b>

### Substituting only \$100 deductible for \$50 deductible:

\$25/100,000 PL .....	\$ 53.10
\$10,000 PD .....	15.20
\$2,000 medical .....	11.00
\$100 deductible .....	23.00
Comprehensive .....	14.00
	<b>\$116.30</b>

### With the good-driver discount, prices are:

\$25/100,000 PL .....	\$42.50
\$10,000 PD .....	12.30
\$2,000 medical .....	10.00
\$100 deductible .....	18.00
Comprehensive .....	14.00
	<b>\$96.80</b>

### If customer drives under 7500 miles per year:

\$25/100,000 PL .....	\$36.90
\$10,000 PD .....	10.70
\$2,000 medical .....	10.00
\$100 deductible .....	18.00
Comprehensive .....	14.00
	<b>\$89.60</b>

(Note: If he also happened to be a farmer, this man's coverage at this point would only cost about \$59.00.)

(Or, if he used a pickup truck instead of a car the total premium would be about 25 percent less, or about \$67.20.)

### If his car is a compact:

\$25/100,000 PL .....	\$33.20
\$10,000 PD .....	9.60
\$2,000 medical .....	9.00
\$100 deductible .....	16.20
Comprehensive .....	14.00
	<b>\$82.00</b>

### His second car will get a special discount:

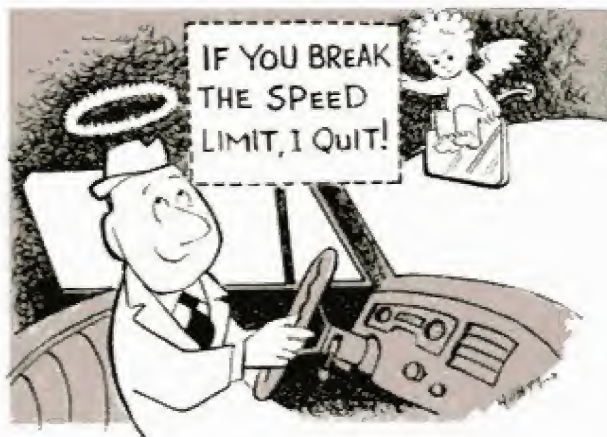
Premium .....	\$82.00
Less .....	- 20.50 (25%)
Total .....	<b>\$61.50</b>



## PM Shopping Guide

checking on new, unknown, out-of-state insurance companies. While attempting to get started in your area, a new company might take on risks that have been turned down by established firms.

6. Make sure the company you select has adequate facilities for handling a possible future claim *wherever you might drive your car*, especially outside the U. S.



Also, because the auto-insurance business is competitive, the individual judgment of agents often counts for more than is popularly supposed. The agents of many companies can give you special consideration if you have a unique problem or if you press for the best deal you can get.

So, after you've chosen a reputable company, find out whether this company has good *local* representation for best possible service in case of claims. Also, when checking to see if this company has representatives in other parts of the country, and outside it, find out whether it has bonding facilities wherever you plan to go. If it is not set up to post bond for you without charge, better try elsewhere.

As for coverage, this is an individual decision, but here are suggestions:

For personal liability and property damage, the long-popular 5-and-10 policy is today considered inadequate. The huge sums awarded in current liability suits make it wise to consider \$25,000-to-\$50,000 minimum coverage for personal-liability protection. This five-times-greater PL coverage costs only about 30 percent more.

Similarly, the experts agree that \$10,000 should be minimum coverage for property-damage liability. Happily, you can double your PD coverage, from the popular \$5000 level, for only about 10 percent more.

Medical-payment coverage is an economical buy, about \$6 per year for \$500 per person injured in your car. And you can double this coverage for about \$3 more, quadruple it for an additional \$1.

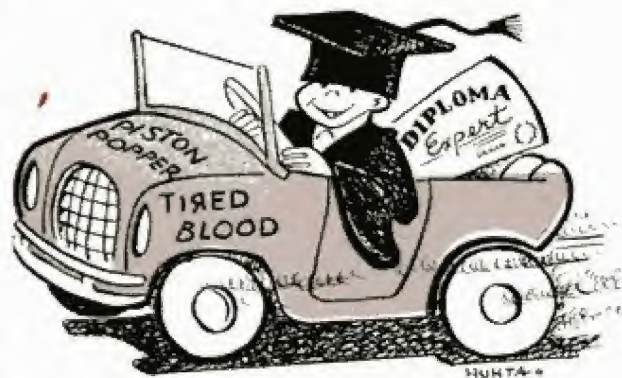
Collision insurance is almost mandatory if your car is less than five years old, but

it's hardly worthwhile to carry \$50 deductible anymore. Suppose \$50-deductible coverage costs \$30 per year for your car; \$100 deductible would run about \$19. So with \$50 deductible you'd be paying \$11 extra per year to protect only \$50 worth of your car, while the entire remaining value was being protected for only \$19. Collision insurance, basically, is to protect you from severe financial loss, not just \$50 worth.

Comprehensive insurance, which covers repair-or-replacement costs of car damage not caused by collision (fire, theft, storms, vandalism, etc.), is the last of the standard insurance coverages. But there are other angles of coverage which some car owners might wish to investigate.

On collision insurance, instead of straight deductible, some companies offer more expensive diminishing-deductible or disappearing-deductible, by which the company pays the entire amount of losses over \$100, the car owner pays all losses under \$50 and they each pay a portion on losses between \$50 and \$100. On another type, the 80-20 deductible, the company pays 80 percent on losses up to \$250, the insured 20 percent. On losses above \$250, it becomes a straight \$50 deductible.

Another new coverage is protection against bodily injury by uninsured automobiles. The company pays all sums to which the insured would be legally entitled to receive from the owner of an uninsured automobile.



Many farm bureaus (there is generally one in each state) sell auto insurance, and their rates are lower than most. A membership fee, usually \$15 per year, balances it out somewhat, but this is one more possibility when shopping for insurance.

Again, on teen-agers, many insurance companies have differing views (and premiums) on how to insure them as drivers, especially in two-car families. This is one of the most expensive items of coverage and requires the most investigation.

Auto insurance is important to car owners and it can be expensive. Or you can save with safety. It's up to you. ★ ★ ★

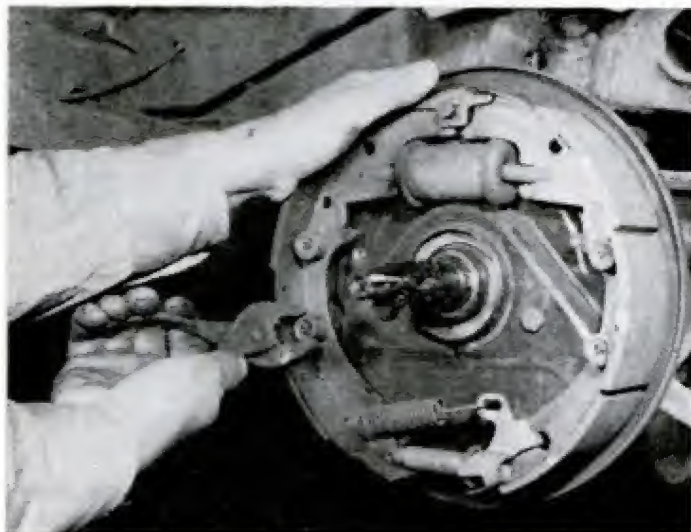




**HIGH-SPEED STOPS** showed sintered metallic linings nearly twice as fade-resistant as asbestos linings

**VELVETOUCH** metallic linings are bonded to shoes in separate segments; brakes are otherwise unchanged

**METALLIC LINING** wear after tests was .003 inch, which means an expected life of about 25,000 miles



## Those New Metallic Brake Linings —

*How good—or bad? PM makes its own exclusive tests for you*

**R**ECENTLY A Bedford, Ohio firm began marketing a new type of brake lining called Velvetouch Metalik.

The new lining is made of sintered iron powder and graphitic carbon, along with other "inorganic friction-modifying additives," according to the manufacturer, the S. K. Wellman Co.

Molded to brake shoes, these linings are sold in sizes to fit all popular passenger cars, including imports. The primary shoes have two bonded segments; the secondary shoes have three bonded segments.

In general, these linings are similar to the metallic linings offered as a regular production option on Chevrolet's Corvette and the hot new sports Impala.

The Wellman Company makes six major claims for their Velvetouch linings, which,

if true would make them a desirable replacement for conventional asbestos composition linings.

Here are their major claims: (1) no high-speed fade; (2) no heat fade; (3) no downhill fade; (4) no water fade; (5) no squeak or squeal; and (6) superior life.

A modern miracle? Perhaps not, but certainly a genuinely worthwhile improvement in driving safety if the claims are true.

In order to prove (or disprove) these claims PM ran a set of Velvetouch linings through a grueling series of tests to determine if the brakes (and the claims) would fade.

Most of us know brake fade as the loss of braking action experienced after we use our brakes rapidly and repeatedly in steep





**WET-BRAKE-STOPPING** power test was made by driving car into nearby lake to soak the drum and linings

mountain driving, or try to use them after running through water. Technically, brake fade is the reduction of the coefficient of friction between lining and drum caused by heat or introduction of an antifriction agent or lubricant, such as water.

Fade is measured by recording the pedal pressure necessary to apply the linings to the drums with sufficient force to obtain a deceleration rate of 0.2 Gs recorded on a Tapley accelerometer. A rise in pressure would indicate a positive loss of stopping effectiveness of the linings.

PM comparison tests were run on a 1960 Ford Fairlane sedan (V8, automatic transmission) with unassisted brakes in three series: (1) with Velvetouch Metalik linings; (2) with the standard asbestos linings on the car, which had been driven approximately 12,000 miles; and (3) with a new set of replacement asbestos linings obtained from a Ford dealer.

The linings were purchased to fit standard drums and checked to determine whether radius grinding was necessary to size them. The shoes fit, so were installed as purchased. Velvetouch installation instructions specified .004 to .010-inch toe-and-heel clearance and PM's set had .006.

The old standard linings were adjusted for drum clearance and run "as is." New asbestos and metallic linings were run in by driving through across-town traffic and then making approximately fifty decelerations in the 70 to 40 m.p.h. range. Drum clearances were then rechecked and the tests were started.

Fade-inducing conditions were created by subjecting the car to a series of rapid

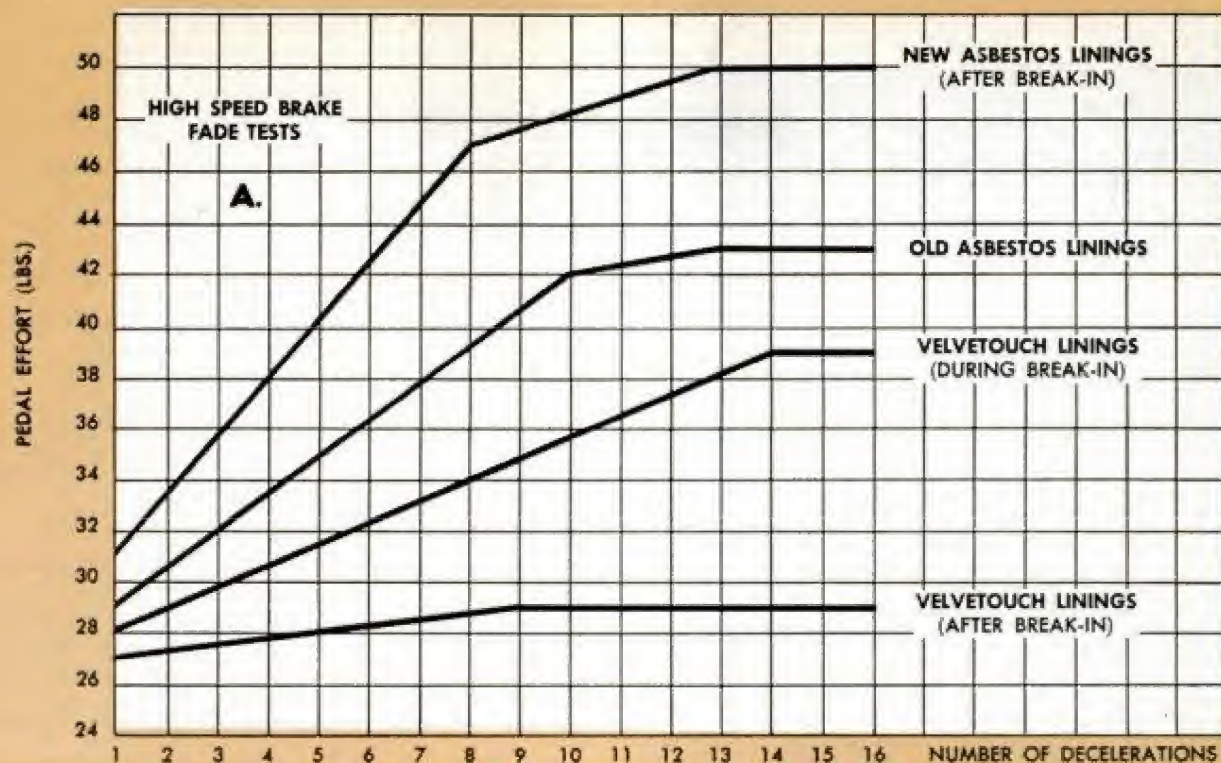
accelerations and decelerations from 70 down to 40 m.p.h. The car was braked uniformly at 0.2 Gs measured by the Tapley meter, and accelerations were made at wide-open throttle. The results are plotted graphically on page 119. The fade test results speak for themselves. Velvetouch Metalik linings exhibited slightly lower initial pedal effort requirement. Even more interesting, pedal effort requirement had only increased by 7 percent after 16 decelerations, compared to a 53 percent increase in effort for the average of old and new asbestos linings! During break-in, the Velvetouch linings had about 50 percent pedal effort increase, which still resulted in lower pedal effort than for the asbestos shoes. (While we might expect a small decrease in fade for the new asbestos linings after a much longer running period, the fade performance of the old linings will serve to illustrate about the best condition we'd expect. The old linings were well seated and only slightly glazed.)

### Water Tests

PM decided that the best type of test for water-fade susceptibility was to immerse the brakes in water, so that's just what was done. The car was driven into a lake until water was up to the door sills, run slowly for about 200 feet, and immediately accelerated down the lakeside road.

Four successive test stops were then made from 30 m.p.h. Then, back in the water. After about an hour of this, it was decided that wet-brake stopping distances are largely unpredictable. Testing was continued, however, on the theory that while





**SUPERIOR FADE-RESISTANCE** of Velvetouch linings was proven (see above) when, after 10 successive stops, 50 percent more pedal pressure was required to achieve equal deceleration on car with asbestos linings. Meter (see right) assured uniform .2-G stops

stopping distances could not be reproduced exactly each time, a range of stopping distances would certainly be an indicator of the brake's capabilities. Here again, the results were interesting indeed!

Maximum distance for the first stop with wet asbestos linings was 163 feet, while the maximum distance for the Velvetouch linings was 65 feet. Probably just as significant was the difference in "pulling" tendencies as the brakes dried. The Velvetouch linings did not grab or pull appreciably, while the asbestos liners would suddenly get a bite on one wheel only and man—you'd best have an iron grip on the steering wheel.

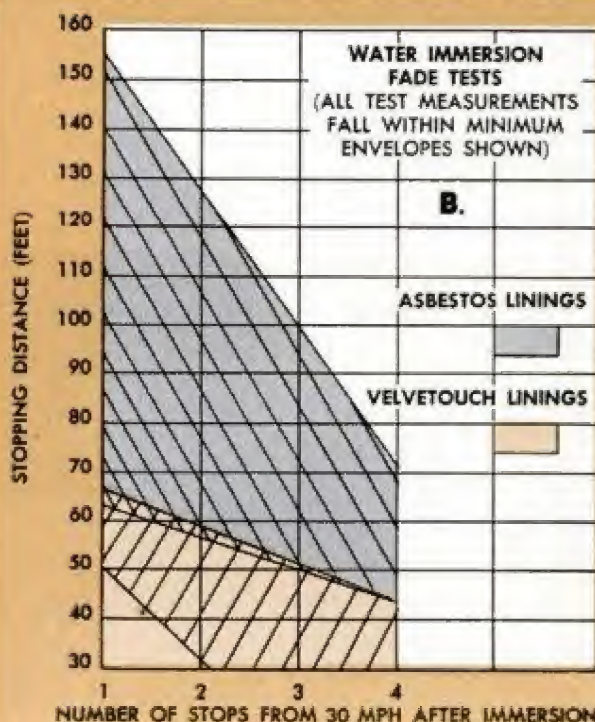
These sudden pulls occurred in the second to fourth test stops. (Perhaps part of the fade resistance of the Velvetouch Metalik linings is due to the segmented, square-edged configuration, which would tend to give a better wiping action.)

No noticeable chatter occurred during any of the tests. Both the new asbestos and the Velvetouch linings squeaked after the high-speed fade tests. The asbestos lining squeak was slightly more pronounced, but disappeared upon readjustment of the shoes.

The Velvetouch liners retained a slight

(Continued to page 218)

**BRAKING CAR** with thoroughly wetted linings (see chart at right) showed asbestos linings required 2½ times greater stopping distance on the average than metallic linings with the same pedal pressure





# Better CARKEEPING

● **STALLING**, difficulty in restarting, may be caused by dirt under the carburetor-float valve, producing flooding. Cure this by disconnecting fuel line at carburetor, plugging it temporarily and running engine until it stalls. When you reconnect the fuel line and step on the starter all debris will be flushed out

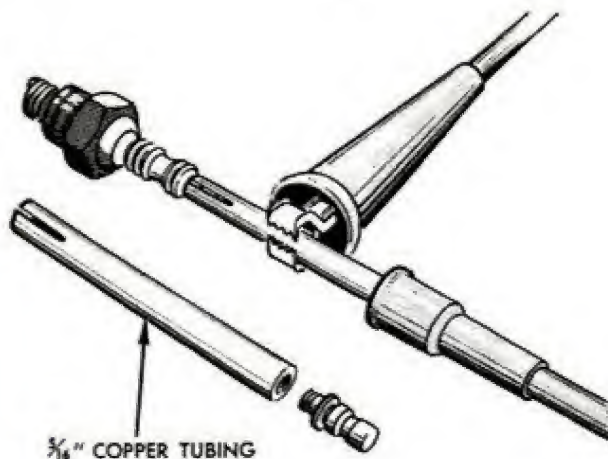
● **ROCKER PANELS** are susceptible to rust during winter months due to mud, salt and snow being continually thrown against them by the wheels. Therefore, it is particularly important that you clear the drain slots periodically with a wire so that water will drain out before it has a chance to cause any rusting

● **TO SECURE LOAD** in a box-type car-top carrier so that it cannot shift, place a deflated inner tube in box with valve stem accessible, put load on top and tie down. Drive to the nearest station and inflate tube. Inflated tube will force load against tie ropes, preventing shifting. To unload, simply deflate the tube

● **BURNED OUT** ignition switches on 12-v. systems can be caused by overloading due to addition of too many accessories. Twelve-volt switches now carry about 30 amps, but if necessary, you can use a 50-amp. relay actuated by the switch. Remember to use only dry graphite on an ignition switch, never grease

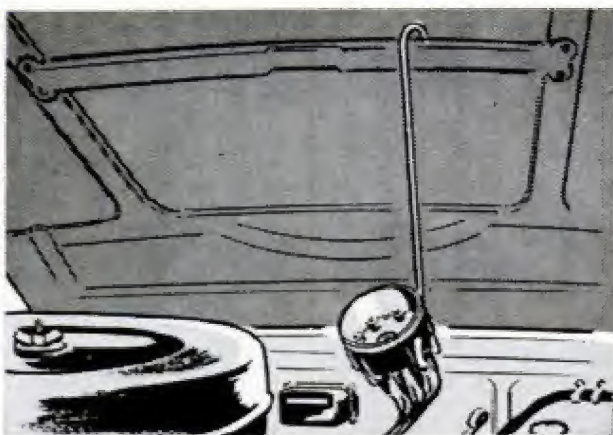
● **IF YOU TEST** resistor-type spark plugs in a tester where spark is observed visually, remember that spark will not appear as strong as that of a nonresistor plug since light-producing high-frequency oscillations are eliminated. It takes close observation to determine quench point for comparison with new plug

● **WINDSHIELD WIPERS** on some older cars often stop working when driving up a grade due to weak compression. As an emergency measure, disconnect tube from right-hand wiper motor and plug end with a pencil. This often gives enough power to motor on driver's side to keep wiper working until you reach a garage



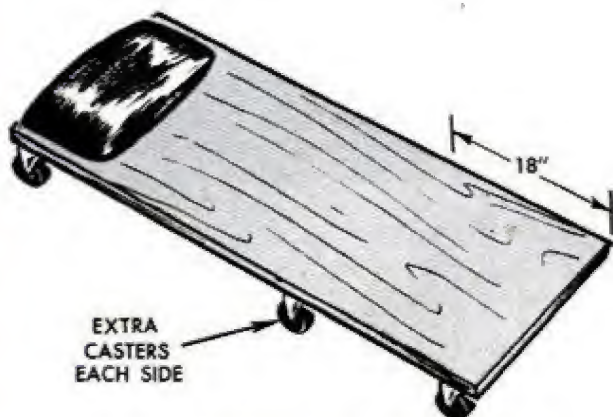
$\frac{3}{16}$ " COPPER TUBING

**SPARK-PLUG ADAPTER** provides a secure mechanical and electrical connection for clip from timing light, making it unnecessary to slit molded waterproof boot on plug lead. Solder terminal post from old plug to a 3-in. length of tubing and slit opposite end



**DISTRIBUTOR CAP** can be kept from obstructing view when installing new points by hanging it from one of the cross members which strengthen the hood. Use a short length of fairly stiff wire to make the hanger, forming a hook of suitable shape at each of the ends

**TWO EXTRA CASTERS** installed on your creeper will make it much easier to roll over holes, cracks, depressions and rough spots in the floor. Since the lower end of creeper is usually moved about more, mount the extra pair of casters 18 in. from that end



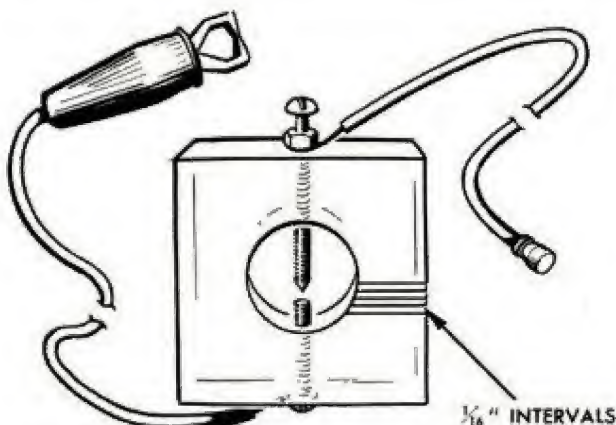




**ASBESTOS SIDING** can be used to give your car enough traction to walk out of slight depressions and slick spots in the snow. A couple of short pieces of siding carried flat in your trunk will be out of the way, but ready for instant use in case of an emergency



**WINDOW WASHERS** on your car will work with greater efficiency if you add a teaspoonful of liquid detergent to the washer tank. This mild mixture will do a much better job of removing the dirt and oily road film which normally resist plain water



**CALIBRATED GAP** simplifies testing engine ignition by jumping spark. Drill a 3/4-in.-dia. hole through a block of clear plastic, thread it for screws and scribe the interval marks. Connect spark-plug lead to one lead and clip other lead to the engine block

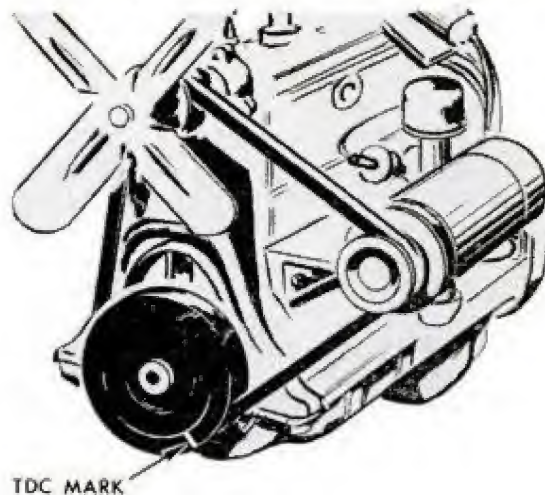


**AVOID CORROSION** on battery posts by cutting 2-in. washers from an old felt hat, wetting them with a few drops of motor oil and dropping them over the posts before putting on the clamps. Oil the felt each time the car is serviced so it won't dry out

**SMALL FUNNEL** connected to a length of small-diameter rubber tubing makes an effective stethoscope for tracking down vacuum leaks around the carburetor and engine manifold where the noises made by such leaks are generally drowned out by other engine sounds



**TDC MARK** on timing pulley will be much easier to see if you clean the pulley thoroughly and paint it with black stove polish, then dab a bit of white or aluminum paint on the TDC mark and pointer. The marks will show up well, even with a low-intensity neon light







**SATURDAY MECHANIC**

## Pressure Caps and Thermostats

*These out-of-sight units are the everyday work-horses of the system which keeps your car engine at just the right operating temperature*

**By Herb Carrier**

*13803 Fairmount Ave  
Detroit 5, Mich.*

**I**T'S JUST AS important to keep the engine in your car warm as it is to keep it cool. As a rule there is only a few degrees difference between "too cold" and "too hot" when these terms are applied to engine operating temperatures. A few degrees more than too hot or too cold and the engine (also the automatic transmission) can be operating dangerously hot or dangerously cold. Either extreme means greatly accelerated wear or possible failure of wear parts within a very short time. Also there

are side effects such as increased fuel consumption and increased formation of the sludge, gums and corrosive acids that damage wear parts.

A thermostat is an essential part of the cooling system simply because it holds engine temperature within definite limits. In winter the thermostat remains closed for a longer period, restricts coolant circulation and shortens warmup time to the minimum. The thermostat may also operate in a partially open position to tailor coolant circu-



lation to operating conditions. You start your car on a nippy winter morning. The 'stat will be closed. You drive slowly until the engine is very nearly warmed up (this is better practice than allowing long idling periods for warmup) at which time the stat may be partially or fully open. But when the engine finally does reach normal operating temperature you may be cruising on the open road where air rushing through the radiator provides more than adequate cooling. At this point the stat will close partially and restrict circulation of the coolant until the engine temperature comes up to normal again. Or, it may remain partially closed until you are stopped by a traffic light or are slowed by heavy traffic. Then it will open quickly to allow full circulation of the coolant.

That's why it's so very important that you have your car equipped with the right stat for local driving conditions and for summer and winter driving in the colder climates. A thermostat is necessary in summer and it's essential in winter, but not in all climates do you use the same stat through both seasons. If, for example, you live and do most, or all, your driving in southwestern desert country you probably will get along very well with a 155-160-degree-F. stat which begins to open at 155 degrees and is fully open at 160 degrees. But if you drive during the winter months where temperatures may drop to zero F. or below, you'll need a 180-degree stat for winter and a 160-degree unit for summer driving.

### Change Thermostat

This means that you change stats, Fig. 1, when you drain antifreeze in the spring and when you refill with antifreeze in the fall. If you use the wintertime stat through the summer, your engine will be running too hot most, if not all, of the time. Not only that, you risk losing a portion of the antifreeze if you leave it in the cooling system during the summer, a practice not recommended. If you use the summertime stat throughout the winter, the engine will be running too cold, generally with a crankcase (also automatic transmission) full of sludge at the end of the season.

You Saturday Mechanics who like to tinker with the car should always check a stat for proper operation before you install it. Fig. 2 shows one reasonably accurate way to do this. Hang a reliable thermometer in a pan of water, hook a length of fine wire under the thermostat valve (the size of the wire is purposely exaggerated in the illustration) so that you can support the stat just under the surface of the water. Then heat the water and note the tempera-

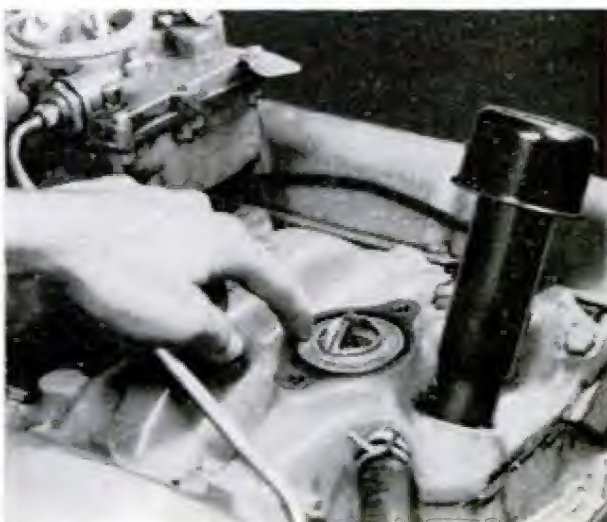


**1. THERMOSTAT** should be changed each time antifreeze is drained in spring or added in fall. Be sure to use 'stat rated for your climate and kind of driving



**2. SATURDAY MECHANICS** can check a stat in a few minutes with this setup. Use a reliable thermometer and clean water. Hook thermometer over side of pan with bulb submerged. Stat should open at rated reading

**3. WHEN REPLACING** stat be sure it is properly seated and that the gasket is correctly positioned. Head bolts holding the neck should be tightened with torque wrench to tension specified in recommendations





# HEATING AND OVERHEATING

## CAUSES AND CORRECTIONS

TROUBLE SPOT	SYMPTOMS	CONDITION	CORRECTIONS
Lubrication	Noisy engine, low oil pressure, thin oil on dipstick.	Oil dilution. Excessive and chronic oil dilution. Sludge in pan. Clogged oil pump screen.	Oil change. New rings—overhaul engine.  More frequent oil changes. Remove and clean screen and pan.
Timing	Hard starting, sluggish engine, poor moderate-speed operation.	Breaker arm wear (points too close). Loose distributor. Defective spark-advance mechanism in distributor.	Adjust point gap to specifications.  Tighten clamp securely. Repair or replace.
Combustion	Poor moderate-speed operation.	Partially clogged jets in carburetor. Low fuel level in carburetor.	Clean carburetor.  Adjust float level to specifications.
Engine loading	Sluggish performance, high engine temperatures.	Dragging brakes. Constant high speed operation. In-gear loading (manual transmission).	Adjust brakes. Temper driving habits.  Shift gears at recommended road and engine speeds.
Coolant loss	Loss of cooling liquid, gain in oil level, bubbles in coolant, oil in coolant, visible drippings or stains from coolant thrown by pump pulley.	Radiator, hose leaks. Coolant in oil pan. Foaming, pump draws air. Oil in coolant. Pump leaks. Coolant overflow. Alcohol evaporation.	Repair or replace. New head gasket. Repair or replace pump. New head gasket. Repair or replace pump. New head gasket. Replace antifreeze.
Loss of effective radiation surface	Cool spots on surface of radiator core, poor heat dissipation.	Loose radiator fins. Radiator tubes clogged.	Solder, or new core. Boil, or rod out.
Reduction or loss of cooling air stream	Reduced airflow, belt squeal, no air from fan, rapid temperature rise, reduced air flow.	Fan belt slips. Broken belt. Air grilles covered.	Adjust belt. Replace belt. Remove covers.
Restriction of coolant circulation	Soft and expanded hose, lack of circulation, rising engine temperature, poor circulation, engine hotter than radiator, unequal engine heating.	Swollen hose. Loose pump impeller. Loose pump belt. Corroded impeller. Wrong head gasket. Jacket clogged. Corroded water tube.	Replace hose. Repair or replace. Adjust belt. Replace impeller. Install correct gasket. Flush block. Install new tube.
Inadequate heat transfer (from cylinders to coolant)	Engine hotter than radiator.	Scale in jacket. Rust and dirt in jacket. Jacket partially clogged.	Use cleaner, flush. Use cleaner, flush. Flush block.

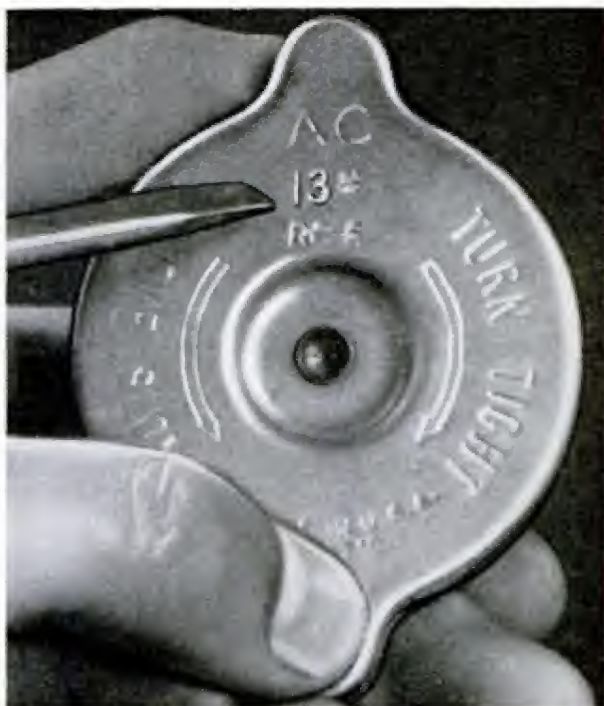


ture at which the stat begins to open. It should begin to open right on the nose, at 155, 160 or 180 degrees on the thermometer. If it lags appreciably, install a new stat.

Another point: Be sure when installing the stat to use a new gasket and make certain that it is properly positioned, Fig. 3. Then replace the neck and tighten the head bolts, or screws, to the tension specified for your car, using a torque wrench as in the illustration on page 122. Fig. 5 pictures the common types of stats you'll find in cars.

### Pressure Cap

The pressure cap, Fig. 6, works hand in hand with the stat. The main purpose of the pressure cap in present-day cooling systems is to prevent the tendency to develop the condition known as water-pump cavitation. This is similar to fuel-pump vapor lock. When water pumps cavitate there is an almost complete stoppage, or cessation, of coolant circulation, even though the pumps are operating properly and the coolant level is adequate. The spring-loaded seal of the pressure cap seats on the radiator filler neck. This seals out air and raises the pressure inside the cooling system to the figure stamped on the cap. Fig. 4, in this case to 13 pounds per square inch. Should expansion of the coolant due to heat raise the pressure much above the value stamped on the cap, the spring tension of the cap seal will be overcome and the system vented to the atmosphere until pressure returns to normal.



**4. PRESSURE CAPS** are marked with a figure indicating rated pressure in pounds per square inch. If you replace cap, make sure to install one correctly rated

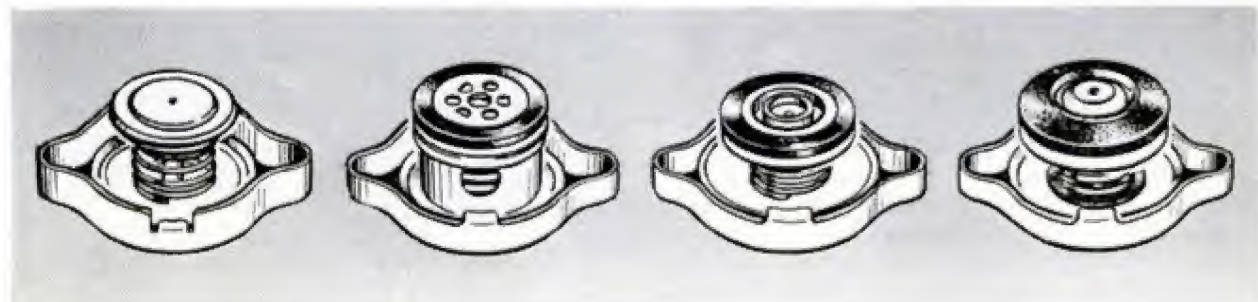
In addition to eliminating the tendency to pump cavitation, the pressure cap also raises the boiling point of water about three degrees for every pound of pressure. This raises efficiency of the cooling system and also prevents loss of coolant. Obviously, a cooling system designed to operate under a specific pressure will not perform prop-

(Continued to page 206)



**5. THERMOSTATS** you'll find in most of today's cars. Two at left are pellet type; one at the right is a bellows type. Always test a stat before installing in your car, even a new one, as it may have been damaged

**6. PRESSURE CAPS** may vary somewhat in general appearance but they are all designed to accomplish the same thing—maintain a uniform pressure in the car's cooling system. Here are four common types







*By Arthur J. Goldberg*  
*Secretary of Labor*

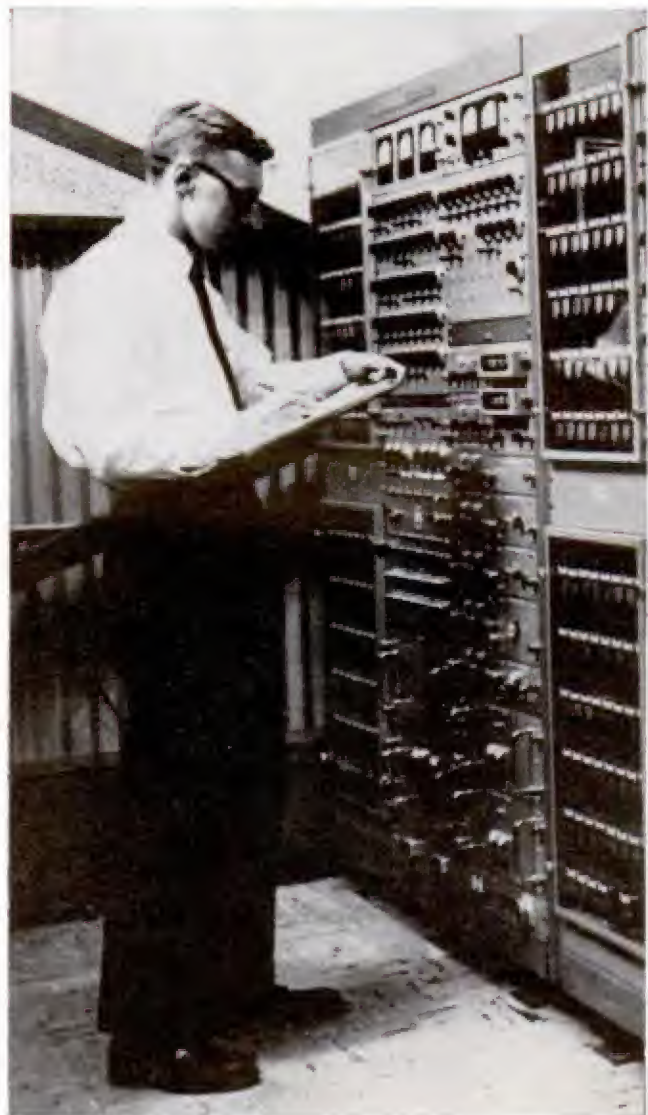
# How will automation affect your job?



**RAILROADING**, right, was nothing like this 50 years ago—or even 10. Typical of growing need for new skills in old-line businesses is the ability to operate New York Central's electronic brain



**FAMILIAR SIGHT** by the middle of the century was a job that didn't exist at the beginning of the 1900s—auto assembly. The existence of cars, of course, creates need for skilled mechanics—a group that has doubled in size in just 25 years



**POPULAR MECHANICS**



**W**ILL MACHINES and new techniques replace workers of skill and knowledge?

More precisely, will automation take *your* job away? Will the skilled worker of today be the forgotten man of tomorrow, working at a lesser job, or no job at all?

I could answer this with a flat no, but the answer is not that simple. We must first establish a few bench marks, score a few lines, examine a few blueprints of our industrial structure.

The first thing to understand is what we are talking about. There is nothing new about automation except the word itself. It is the latest label for the natural endeavor by man to find an easier way of making and doing things—ways to replace human effort with mechanical or other forms of energy and control. This has been a natural *evolution* through the centuries, speeded up so dramatically since the last great war that we are prone to think of it as a *revolution*—a revolt, so to speak, against the old order of things. A revolt,

however, connotes the overthrow of an old order, a complete change to the opposite pole.

But is this true of automation? Is this so-called second industrial revolution about to replace jobs requiring skill and knowledge with machines?

Of course not, even though the implications of technological changes are enormous. They present us with some of the knottiest problems of unemployment today. And they foreshadow major problems for the immediate future as well. Just the past 15 years have seen dramatic changes where some job fields have already declined significantly, while others have taken on added importance—and still others have appeared for the first time.

In the physical sciences alone we now need people in fields which were completely unknown 15 years ago, fields such as data telemetry, microminiaturization, and transistorized circuitry.

Changing technology has also had important effects on many skilled occupations

*In the next 10 years, we'll need more skilled workers than ever . . . but each must broaden his skills so that he can cope with change*

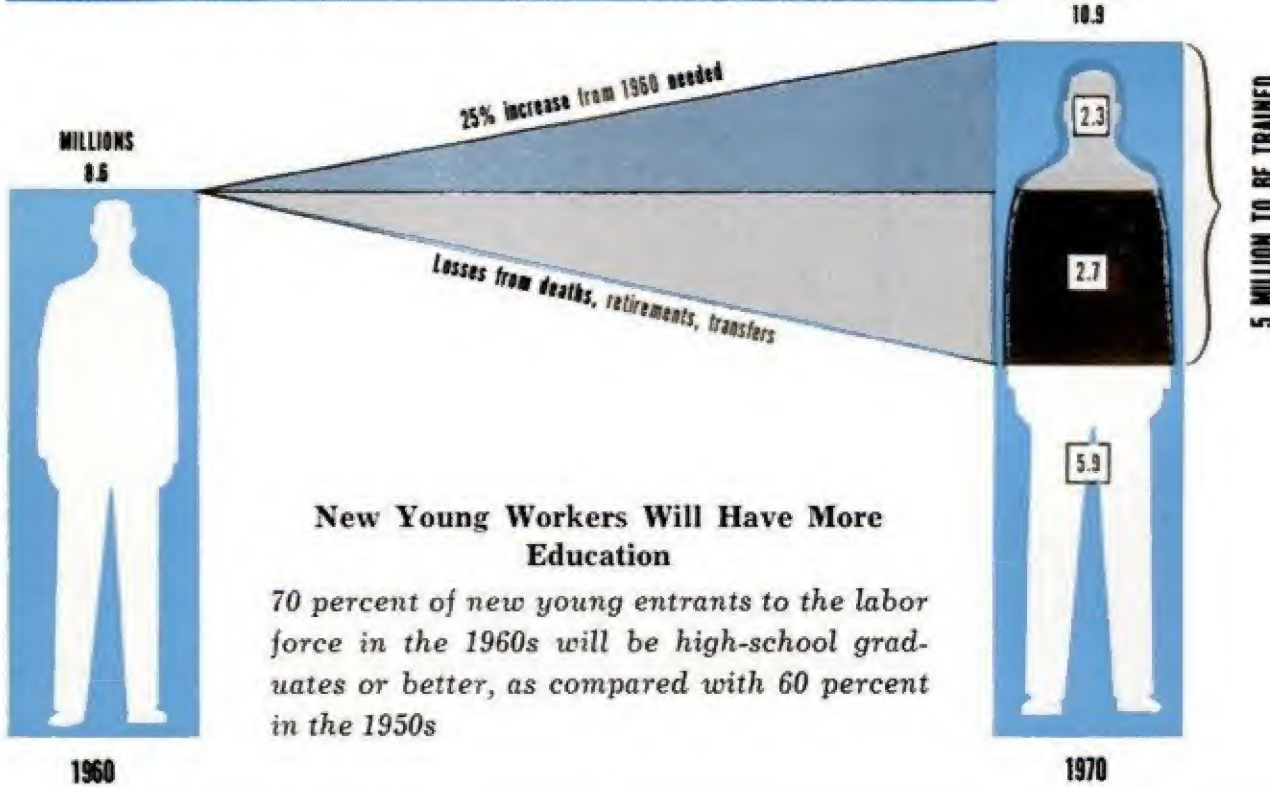
## MANPOWER CHANGES IN THE 1960s

	1960	1970
	millions	
Labor force will grow dramatically— increasing by 13.5 million.....	73.6	87.1
Young workers (under 25) will account for nearly half of the growth.....	13.8	20.2
Older workers (45 and over) will increase by 5.5 million.....	27.9	33.4
Male workers, 25-44, the primary working group, will show only a small increase.....	22.3	23.2
There will be many more women in the work force.....	23.6	29.6
Part-time workers will account for more than a fourth of the labor-force increase.....	12.1	15.9



**AERONAUTICAL ENGINEER** follows product from drawing board to customer, so he must be familiar with processes of development, testing and production. Here a Douglas engine checks a jet engine prior to installation





within the craftsman group. Take the case of the blacksmith, whose employment fell from 230,000 a half century ago to only about 40,000 now; the glass blower, when automatic glass-blowing machines took over; the hand cigar-maker, the barrel-maker.

On the other hand, technological changes have favorably affected other skilled occupations. Employment rose for the tool and die maker when the metal-working industries shifted to mass-production methods. More tool and die makers were needed to make the cutting tools, holding devices and dies which were necessary for producing metal parts in large quantities.

Since 1900, mechanization and new inventions have also created many new skilled and specialized occupations. Look at the automobile, airplane, and diesel mechanic; electrical-appliance serviceman; instrument repairman; telephone-equipment installer; and operating engineer (construction-machinery operator).

Some of the new occupations have grown enormously. About 750,000 auto mechanics are currently employed, more than double the number employed 25 years ago.

When the word automation crops up, remember this if you are in the skilled-worker classification: The proportion of the American work force which is skilled has remained remarkably stable during the 20th Century. While most of the rest of the

broad occupational groups changed in size substantially, the craftsmen have accounted for nearly one in nine of all employed workers consistently since 1900.

Look at these figures: In 1900, blue-collar workers represented 36 percent of the total working population. Of these, 31 percent were craftsmen and foremen.

In 1960, the percentage of blue-collar workers to the total work force was almost identical, 37 percent. But the percentage of craftsmen and foremen had risen to 35 percent of the total.

What about 1970? The number of blue-collar workers will increase as the population grows, but the percentage of blue-collar workers to the total labor force will probably remain about the same as it has been for the past 61 years.

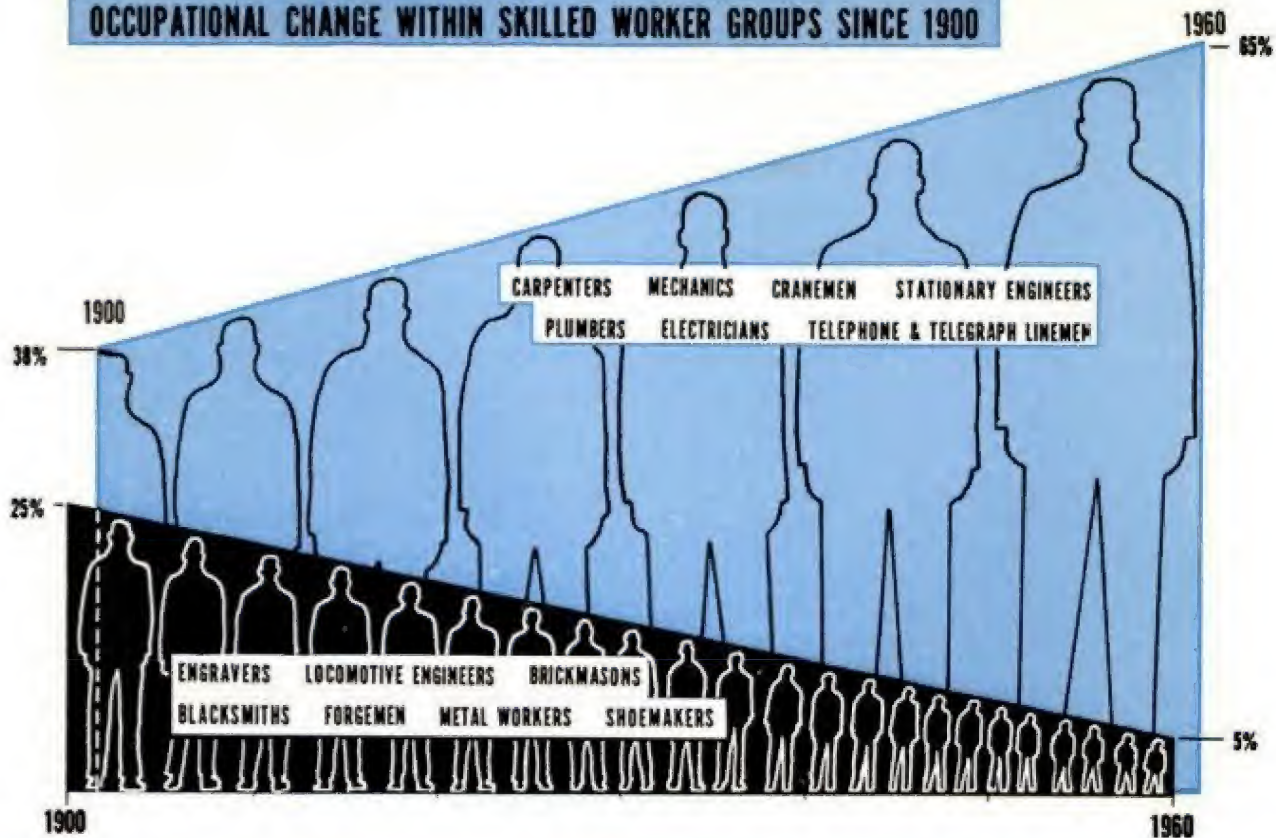
Where automation or technological change has hurt has been in the *unskilled laborers* group. In 1900 these workers represented one out of every eight manual workers. In 1960 they were down to one out of every 20!

Getting back to the skilled sector of the labor force, its relative stability underscores the continued importance of this group. But very great changes have taken place *within* the skilled group, and you will see them continue to take place.

At the turn of the century, engravers, locomotive engineers, brick-masons, blacksmiths and forgers, metal-molders and



## OCCUPATIONAL CHANGE WITHIN SKILLED WORKER GROUPS SINCE 1900



shoemakers were so important in American industry they accounted for one out of every four of the skilled work force. Today, the proportion is down to about one in 20.

Again, back in 1900, carpenters, mechanics and repairmen, cranemen and stationary engineers, plumbers, electricians and telegraph and telephone linemen totaled a little less than two out of every five skilled workers. Today, it is estimated that the figure is closer to two out of every three.

Change, therefore, is one of the major benchmarks of our story, and of great importance and consideration to the skilled working man today.

### More Craftsmen Needed

Against this background, what is the outlook for you if you're the skilled worker, the craftsman, in this decade?

It looks wonderful from the individual craftsman's point of view. The need for craftsmen is expected to rise by about 25 percent, despite all the automation we can expect in the next 10 years. This represents the greatest demand for skilled workers we have ever experienced. We will actually need to train *an additional five million skilled workers by 1970*. We had 8.6 million skilled workers last year. We are going to lose more than 2.5 million by 1970 in deaths, retirements and transfers out of the trades. That leaves approximate-

ly six million from last year's skilled work force still around in 1970.

But by 1970, with our growing population, we will need about 11 million skilled workers. Hence the five million which must be trained in time.

### Toolbox Security

Those of you engaged in the skilled trades must be prepared to take advantage of the times. As of now, we know that about 50 percent of all of our skilled workers are between the ages of 26 and 44. Yet, during this decade, this age group among the men will go up by only four percent. This means that a tremendous demand will develop by 1970 for the man with skill who has experience and on-the-job knowledge. "Security in the toolbox" is no idle phrase today.

This should reassure those of you who have harbored fears about automated technology doing away with skilled jobs. The skilled worker, the craftsman, is definitely here to stay.

The overriding question, then, is not whether automation will take the skilled worker's job, but whether you as an individual skilled worker will be able to withstand the forces of *change in the techniques of your job*.

Let me cite the blacksmith again to explain this point. The need for and therefore, the number of blacksmiths dropped



steadily when the "horseless carriage" began replacing the horse in growing numbers after 1900. This lack of need, this *change*, was stretched over a period of several working lifetimes. It is known as an "absolute displacement." Like the work of the candle dippers, wainwrights and wheelwrights, molders and shoemakers, the blacksmith slowly disappeared as a major skilled-worker group in the U. S.

This illustration of *change* is entirely different today. First of all, it is not taking place over a period of several working lifetimes. Compounded by years of added work-life to the average American worker, *change* is occurring within the period of your working life—even within a decade.

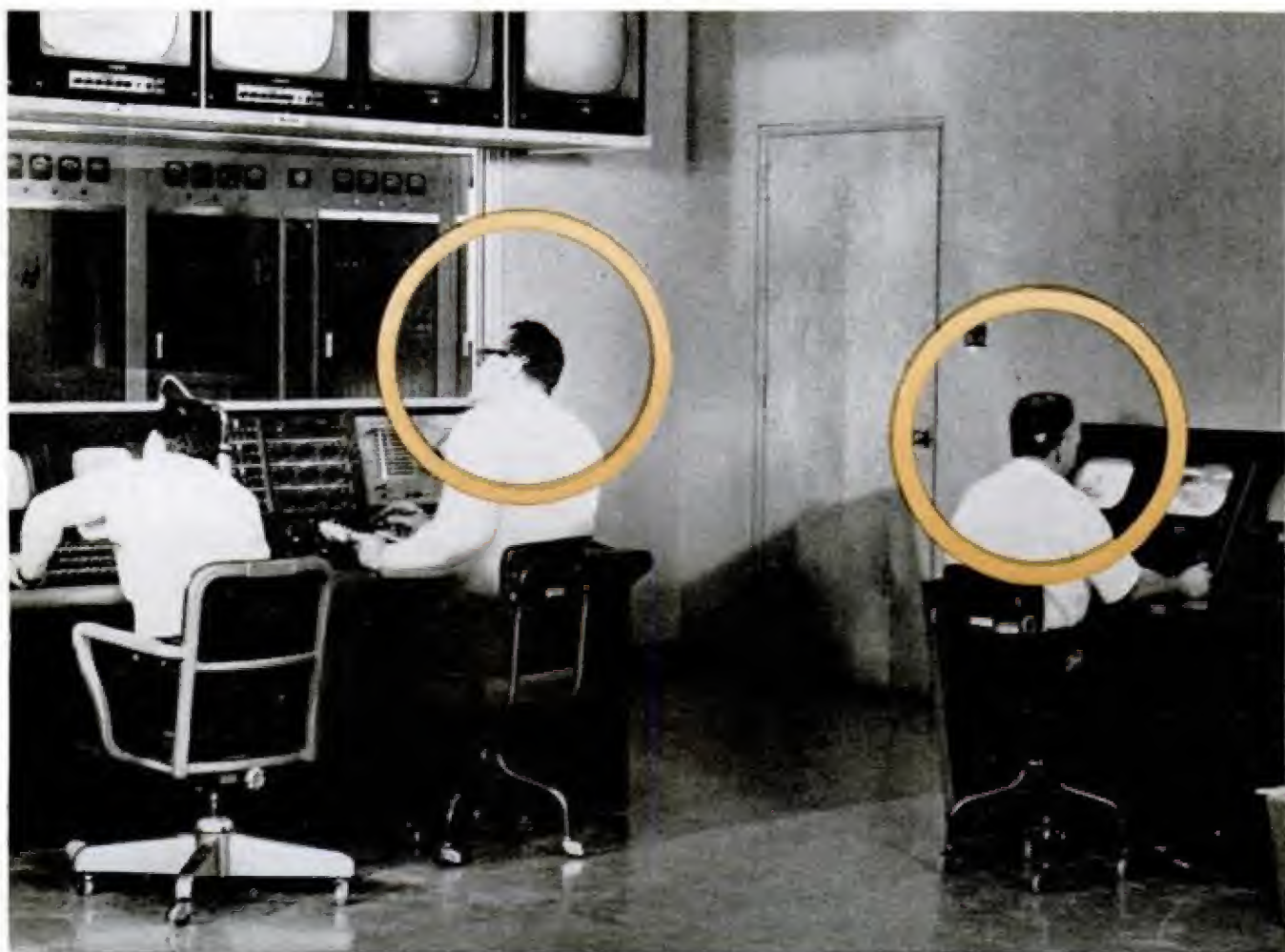
But this change has not been one of absolute displacement except in a few cases such as the coal miner and the automatic coal digger.

### Nibbling Changes

The changes are of a nibbling variety. A few processes here. A technique there. A set of duties in a long operation. But the total effect has been to make the skill requirements of the craftsman even more critical and exacting. An illustration is the recent application of atomic-energy technology to peacetime uses. Craft jobs found

in this activity are similar to those found in related chemical, metalworking, and construction industries. Skill specifications and performance standards, however, are more exacting in the manufacture, installation, and maintenance of material and equipment which may be subject to radiation contamination. Thus, more exacting work and the development of special methods for handling and working with atomic materials and equipment are required to provide adequate leak-proof fittings and joints to shield workers from atomic radiation. Particularly affected by these special requirements have been plumbers, pipefitters, machinists, millwrights, boilermakers, electricians and welders.

There is another area of great interest to you, the skilled worker, and your future—changes coming about for the machining worker and the skill content of his job. There has been a technological breakthrough, known as the numerical control of machine tools, which could have a significant effect on the employment of the more than one million machining workers in the country. It involves the following sequence of operations: Engineers translate part dimensions, tolerances, cutter shapes and sizes, cutting paths and sequence, and other data, all into numbers.





The data are then punched on tapes or cards, inserted into electronic devices which automatically operate the machine tool. The machine-tool operator only installs the tool, inserts and removes the work piece, and changes the tapes or cards.

While it is too early to measure the effect of this development, the consequences should be obvious, if it were applied in industrial production to a great extent immediately.

But the implications of *change* inherent in this example apply to many areas of work, many types of occupations as yet untouched by new processes and inventions sure to come.

You must be prepared with diverse abilities and potential to cope with *change*.

Those of you in the skilled crafts should therefore re-examine your qualifications for the future job market. Many will find that further study and training is needed. Do I have enough reserve education and training to meet unknown future work demands on me? That is the question you should ask yourself. A re-examination should determine your command of arithmetic and mathematics and such added knowledge, for instance, as the ability to read blueprints. Semiskilled workers should be especially aware of such re-

quirements in the future job market, for their jobs are more vulnerable to changing demands, all to the more-skilled levels.

### Melting Demand for Unskilled

High school students have a special need to prepare themselves well. As I stated before, the number of unskilled jobs is melting to a minor portion of the job market. Semiskilled jobs and the skilled jobs are requiring more education and training. A high-school diploma today is an elementary requirement for entry into most of these jobs. Employers are seeking workers who have the potential to learn more and to learn quickly the new skills and techniques blossoming every day in their businesses and factories. And it won't be enough to have just a high-school diploma. It is what was studied and learned well in the classrooms and school shops that will count.

No one is sure today where these swift technological changes are taking us. Both industry and labor are making efforts to train and retrain workers in these fields to meet the new job demands. It is obvious that the skilled worker with better education and training will be prepared best for the job opportunities and changes that are

(Continued to page 220)



## What Happened to the Other Three Men?

THEY WENT with automation—along with 10 others. When WKRC-TV, Cincinnati, Ohio, automated with RCA units, the technical staff dropped from 23 to 10 men. Taped programming, remote-control cameras, etc., have cut costs and almost eliminated all errors





## Dry-Dock Boat Ride

Boat-handling ability and the driver's knowledge of the "rules of the road" are tested on dry land by a new trainer that combines a boat mockup with a movie.

The screen presents 10 common boating situations, and the boat reacts on a curved track to the driver's actions while a mechanical grading device records his score. A score card is automatically ejected at the end of the run.

Developed by the Aetna Casualty and Surety Co., the Sailorometer is touring boat shows to call attention to safe boating practices.



## Aerodynamic Auto Flaps

Borrowing a principle from airplanes, flaps are put on the front end of rear-engine cars to keep the lighter front end from rising at high speeds.

The air-flow diverters force the front end down, increasing traction and avoiding dangerous loss of control. The faster the car goes, the more efficient the stabilizers become.

The safety apparatus won a prize in a recent safety campaign sponsored by the International League for Transportation Safety held in Paris.







## Flying Wind Tunnel

Navy airships have solved the problem of testing models of vertical-rising and short-takeoff-and-landing aircraft (VTOL and STOL). Because of the slow-speed characteristics of these aircraft, standard wind tunnels were unsuitable.

The airships, however, can maintain zero speed or travel more than 60 knots. They are also smooth and stable in flight.

The models, with wingspans up to 10 feet, are hung from a mechanical umbilical cord (a retractable strut) and all power settings, angle changes, etc., are handled remotely from the gondola.



## Juvenile Jiggler

Each child walking or bouncing on any of six rails of a new piece of playground equipment jiggles the other children, creating an ever-changing, entertaining situation for fun and adventure.

The Jiggle-Rail is 20 feet in diameter. Six four-inch-wide rails of tempered spring steel radiate from the two-foot central hub.

Lucker Mfg. Co., 331 N. 4th St., Philadelphia 6, Pa., sells the unit for \$265.





# I BIRLED THE CHAMP

By Patrick K. Snook





**WORLD CHAMPION** Jimmy Running (in plaid) squares off against a Canadian opponent for a practice session. Top, he gets the initial advantage by starting the log in his direction. Second, while his opponent tries to turn around, he kicks water on him. Third, opponent has turned around, and both work log in the same direction. Bottom, a fast foot-shuffle "snubs" the log, and Running's sparring partner goes into the drink. Sudden stops or changes in spin direction usually do the job



*Watching a couple of skilled birlers dig their calks into a floating log and set it spinning, you get the impression that it's an easy sport. I guess that's what made me decide to give it a try . . .*



**I** FOUND world-champion birler Jimmy Running near the end of a dock on a small Wisconsin lake. He and another birler were going through the motions of a flat-out foot race. They weren't going anyplace, but the glistening log beneath their feet revolved at frightening speed.



When I waved, Jimmy made a fast shuffling maneuver with his feet. The log stopped abruptly and his opponent sailed through the air and hit the water with a loud splat.

"That looked easy," I said, and he grinned.

"Well, birling is a peculiar sport." He flicked his feet and the log started to spin again. "It's one of those things that most kids can pick up quickly, but it's almost impossible for an adult to learn." He made a fast, shuffling motion with his feet, and the log reversed its direction.

"Want to try?" he asked. I cautiously stepped onto the end of the log while he steadied it. I found, to my surprise, that balancing wasn't really too difficult.

"You know," he said, "this is what we call a number one, or beginner's log. It's big and stable, so we use it for things like skipping rope, handstands, and rolling with another man on our shoulders. In







**TOUGHEST** kind of birling—block turning—is Running's specialty. Balancing on the short, thick block is hard enough, and only a few besides Running have mastered the technique of turning it end to end



**SKIPPING ROPE** on a number one log is child's play for the pros, but even they slip off sometimes

a birling contest, a big log like this is too easy, so we set a time limit of three minutes. Then the competitors go to smaller logs."

I had now managed to relax a bit and my slippery perch was starting to feel a little more secure under my feet.

"Let's start by getting the feel of a moving log," he said. "Keep your feet pointed at right angles to the length of the log."

"Bend your knees slightly, so you're in a slightly crouched position. Keep one foot just behind and the other just in front of the center of the log. Now use short steps and a heel and toe motion."

The log was now rocking slowly back and forth. Surprisingly, I was still on it.

"Now, let's see if you can roll it," Jimmy said. "Remember, short, quick steps."

The log started to turn and I swung my arms to keep my balance. Jimmy picked up the pace, and I felt as if I were running up a steep hill. I kept my eyes glued to his feet.

"Hey," I yelled, "this isn't so hard."

Jimmy winked. His feet made another of those quick shuffling movements, called "snubbing" in the trade. The log stopped suddenly and I felt myself sail through the air. *Splash.*

The first thing to do when you take up birling is learn to swim wearing shoes.



## Now It's Indoor Skiing

Skiers can get more practice in half an hour on a new indoor "ski slope" than in an average day on a mountain.

The slope is an endless belt of nylon material similar to carpeting, running upward over a ramp at variable speeds. Using short skis with low-friction plastic bottoms and blunt poles, skiers can perform any downhill maneuver—even hold slalom races. Beginners can use a supporting bar.

The Ski-Dek is made in two sizes by Ski-Dek Corp., Caldwell, N. J.

*(SEE WHERE TO FIND IT LIST IN FRONT)*

## Jolts Jet Jockeys

British pilots can test their ability to control a high-performance aircraft in bad flying conditions in a flight simulator built for the Royal Air Force.

Unlike conventional trainers, which are stationary, the new flight simulator throws the pilot around, giving him the same pitch and roll sensations he would get in the cockpit of a supersonic jet.

The cockpit is mounted on a large movable arm which is powered by two electro-hydraulic servos. It is equipped with standard flying controls which govern its attitude and enable the pilot to "fly" the simulator.

However, to test his reactions to unfavorable flying conditions, a special analogued computer feeds disturbances into the control system in any desired pattern—cross winds, gusts, turbulence, etc. The pilot has to fly the simulator through these conditions as well as through "still air."

The cockpit can move from horizontal to maximum tilt in one second.

## Plastic Landing Gear

Because of frequent landings on rough terrain, the stress on landing gears of light planes is great. A Swedish firm has produced a plastic undercarriage reinforced with glass fiber that, in tests, has shown better shock-absorbing qualities than conventional landing gears.

The gear minimizes bouncing on landing and vibration in taxiing, saving wear and tear on the plane's instruments.





# Test Your Quick-Wit Quotient

By Theodore Berland

**Y**OU'RE SITTING next to an empty seat at a lunch counter, reading your newspaper. Above the din of the lunch-time crowd, you hear the click of high heels. You start reading the same sentence over. As you catch a whiff of perfume, you whip your head to the side to catch in full the young woman sliding into the seat beside you.

This, my friend, is awareness. Being a red-blooded male, you are especially aware of attractive females when they reach the fringes of your perception. And you react quickly.

Awareness, too, with the quick reaction that accompanies it, can help you stay out of trouble by anticipating emergencies.

Take accidents. They don't "just happen" because "your number is up" or because of the law of averages. They happen because the situations are right for them to happen. Part of a situation is often a lack of awareness of what's coming and what to do.

How about you? How would you react in an emergency situation? Here are 10 moments of panic that will give you a chance to determine your **quick-wit quotient**. Score yourself this way:

10 correct—you're a quick-wit genius.

7-9 correct—safe man to be with.

5-6 correct—need improvement.

3-4 correct—bad, but not hopeless.

Under 3—stay in bed.

To take the test, read each item and immediately write down your reaction. When you've finished, turn to page 142 and match your answers against the correct ones.

The authority for answer No. 2 is the Outboard Boating Club of America; for the other nine it is the National Safety Council.

**ANSWERS ON PAGES 142-143**





### SITUATION 1:

It's night, and you are driving along a country road. You come across an old car stalled near the top of a railroad crossing. The car is full of people, and the driver is trying to push it off the tracks. You notice that there's no crossing gate or flasher light. Then you spot the light of an approaching train.



### SITUATION 2:

You're steering your outboard motorboat, throttle open, along a deserted stream. Suddenly, you spot a log in your path. Its ends almost touch either bank.







### SITUATION 3:

You're strolling on a sidewalk near a park on a beautiful afternoon. A ball flies through the air right in front of you, followed by a child running as fast as she can to catch it. She dashes across the sidewalk and into the street—oblivious of the car speeding toward her.



### SITUATION 4:

After dusting your favorite roses, you return to the tool shed to find your three-year-old's hands and face covered with insecticide powder.



### SITUATION 5:

You're driving in the middle of a one-way, three-lane street. There is no traffic ahead of you. You slow down to a stop as you approach an intersection where a woman wheeling a baby carriage is trying to cross. She pushes the buggy into the street as she sees you stop. Suddenly, in your rear-view mirror, you see two cars—one on each side of you—racing into the intersection. She obviously doesn't see them.



#### SITUATION 6:

You and your wife come home late one afternoon to find your children have opened your desk drawers and are playing with its contents. In it, you know, is an automatic pistol and ammunition. As you approach the children, one of them—in fun, of course—aims the gun at you.



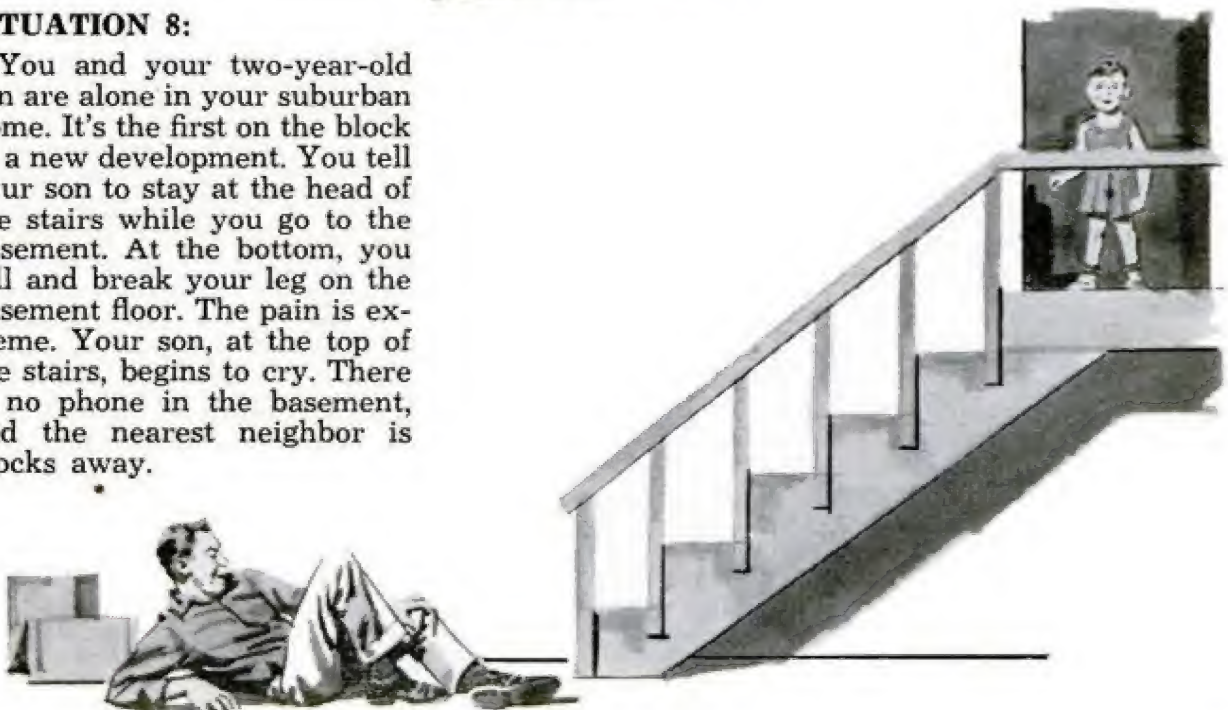
#### SITUATION 7:

As you alight from a bus with your arms loaded with packages, the door closes behind you and you feel a tug. Your coat is caught. The bus starts to move.



#### SITUATION 8:

You and your two-year-old son are alone in your suburban home. It's the first on the block in a new development. You tell your son to stay at the head of the stairs while you go to the basement. At the bottom, you fall and break your leg on the basement floor. The pain is extreme. Your son, at the top of the stairs, begins to cry. There is no phone in the basement, and the nearest neighbor is blocks away.





see APRIL 1962, p. 8



#### SITUATION 9:

You pull up to the curb, your one-year-old in the seat beside you. You put the transmission in neutral, and, leaving the engine running, dash to the house to leave a note in the mailbox. When you come back to the car, you realize that, as is your habit, you've pushed the button and locked the car door behind you. You have no duplicate key.



#### SITUATION 10:

The sky is dark, but it is a sweltering afternoon at the beach of a small resort lake. You walk into the water. It feels refreshing, and you start swimming for a raft out in the water. When you're halfway there, the sky darkens even more. It begins to rain. A stiff wind starts to blow. You hear thunder, and flashes of lightning strike nearby.

## ANSWERS

1. Get the people out of the car immediately! Have them walk back along the road to a safe distance. Forget about the car and don't try to push it with your own auto; it's very difficult to estimate the speed of an oncoming train. It's also virtually impossible to flag it down so that it would stop in time.

The driver, of course, knowing his car was in bad shape, should have gained more momentum to carry the car over the tracks.

2. Cut the throttle! Make a sharp turn—even if it means you'll beach your craft. Brace yourself, and try to yell a warning to your companions to hang on.

You shouldn't be going full throttle down a stream—your speed should be regulated by how far you can see and your stopping distance.

3. Yell at the child as loud and quickly as you can! She can stop in less distance than the car. If the child is close enough, grab her or trip her.

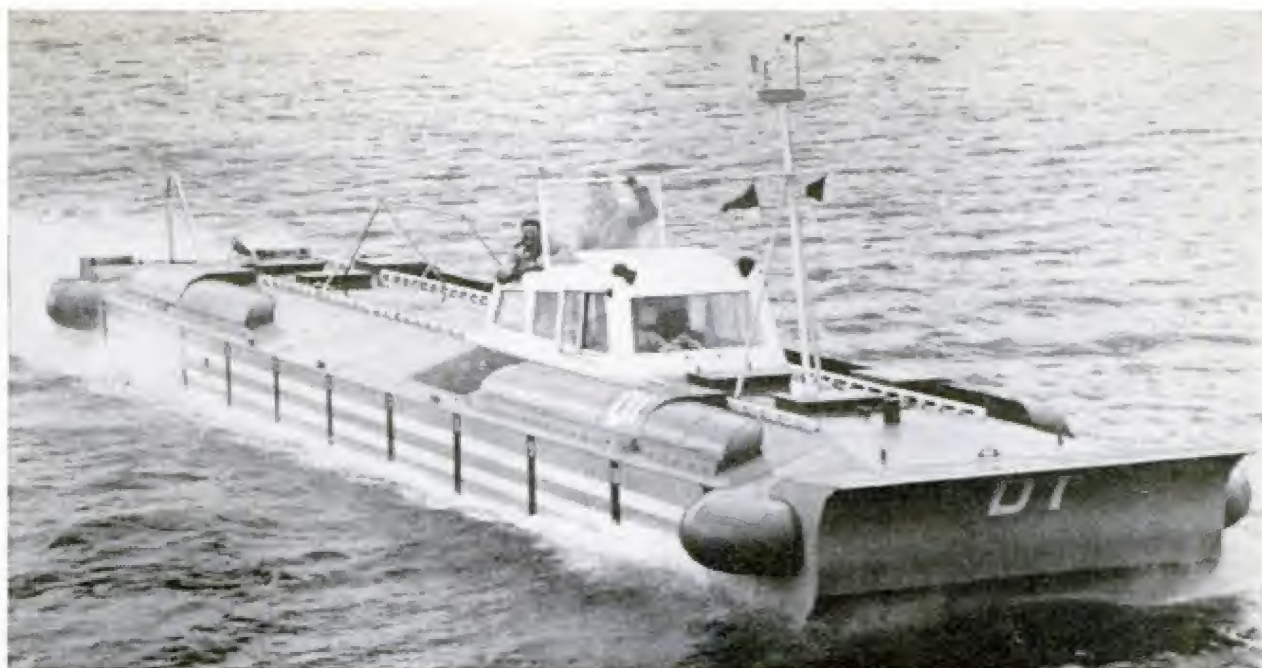
The child, of course, should be taught

not to run into a street. There's one fact you should know, too: If you grab or trip the child, you assume responsibility for the consequences of the act. However, saving a life should be uppermost.

4. Wash his hands and face with water (some pesticides can penetrate unbroken skin), grab the container (the ingredients are listed on the label), and call your doctor! If you can't reach a doctor, have the child drink plenty of water and make him vomit by feeding him warm salt water (two tablespoons of salt in a glass) or by placing your finger far back in his throat. Place his head lower than his hips when he begins retching.

5. Thrust your left arm out the window in a left turn signal and flip your electric turn signal on right blinker. (A driver did this in New Jersey and saved a life.) Four other possibilities: Pumping the brake pedal to flash the rear lights; blasting your horn several times; waving your arms; yelling at the woman.





## Hoverbus – An Air Ferry – Makes Debut

The prototype of the Hoverbus, a new ground-effect machine designed to ferry 200 passengers across rivers and estuaries, recently made public test runs in Scotland.

Developed by a ship builder in collaboration with Hovercraft Development, Ltd., the craft measures 10 by 66 feet. It is intended exclusively for marine use. Its "side walls" never leave the water so it never becomes fully airborne.

The walls on each side and downward jets of air at each end contain the air cushion. Propulsion is by outboard motors.

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## ANSWERS

6. Drop to the floor! Point to an object off to the side and say, "I bet you can't hit that." This will divert the gun from you and give you time to grab it. **Don't** shout, "Don't shoot!" The child might become flustered and pull the trigger. Assume that the gun is loaded at the outset.

7. Yell, so that the driver or a passenger can hear you. Drop the packages. As fast as you can, unbutton the coat and whip it off. You may have to jog a few feet if the bus starts to move, but it takes time for it to reach any speed.

8. Calm down. Control your panic. There's no urgency here. After determining for sure that it's a break, decide if you could stand the pain if you dragged yourself up the stairs. If you can't move, remember that your wife will return in a few hours. If it's a weekday, the milkman or others may come to the door. Instruct your son to tell him daddy is hurt. He might also be able to dial the telephone operator for help. If these don't work, have

your son come down, calm him, and resolve to spend some hours there together.

For safety's sake, it's good to have a telephone at every level of the home.

9. Pick up a brick, rock, stick, or shoe and break the rear side window to get in. Breaking the rear window is less dangerous for the child in the front seat, and the act will help divert his attention from such attractions as the shift lever. If your car is a hardtop or convertible, you could try fishing for the handle with a hook made from a coat hanger.

In most states it's against the law—as well as unsafe—to leave the engine running when you walk away from your car.

10. Go back to shore, get out of the water, and find shelter in a building. Don't try for the raft. Remember that lightning strikes at the highest projection; on a raft, you'd be it.

You'd never be in the situation if you followed the rules: Never swim alone and never swim during a storm.



*Division of Grand Haven Stamped Products Co.*



**INSTANT HOT WATER** comes from an electrically heated dispenser that can be installed anywhere there's water and electricity. Water-Maid, by Sherman Industries, Grand Haven, Mich., costs \$49.95

# WHAT'S NEW FOR Your Home



**MITTEN STORAGE** is as close as the back of a door when the Mitt-Rak is installed. It holds six pairs of mittens so that they dry easily. The item is sold for \$2.00 by Mitt-Rak, 4715 Groveland, Royal Oak, Mich.



**BEAUTY-SHOP HAIR DRYING** right at home is possible with an accessory that may be attached to any Norge automatic clothes dryer. It is adjustable to user's height and hood fits over pin curlers and rollers

**SOFT, GLARELESS LIGHT** from electroluminescent panels keeps stairways easily visible and safe all night. The Rayescent panels are available for \$8.40 each from Solar Sonic Devices, Inc., Hicksville, N.Y.





**STEEL LIFTERS** allow you to handle with ease even the biggest turkey or roast. Set of two sells for \$2.95. Order them from B & G Kent, Box 684, Fontana, Calif.



**TOOTHPASTE** is dispensed by brush holder. Price is \$1 from Pact Manufacturing Corporation, 783 State St., Schenectady, N.Y.



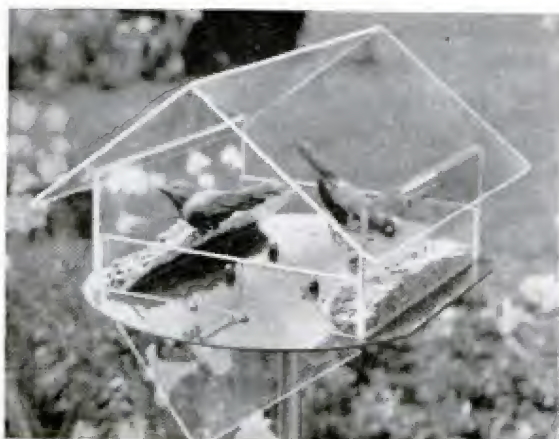
**SPRING - WOUND ALARM** sounds bell when heat sets it off. Priced at \$23.95, it's made by Westron Corp., 652 Hudson St., New York 14



**FOOD WON'T STICK** to ovens or cooking utensils sprayed with No-Stick. Made by Devcon Corp., Danvers, Mass. Price: \$1.29 & \$1.98

**BACK SCRATCHING** becomes a luxury with an electric back-scratcher that has five tiny fingers scratching at 3000 times per minute. \$4.98 from Damar's, 768 Damar Bldg., Elizabeth, N.J.

**PLASTIC BIRD FEEDER** pivots in wind so birds are always protected. Cost is \$20.95 from Dilley Mfg. Co., 1657 Doan Ave., E. Cleveland, Ohio







# How to Outwit an Ouzel— or a Baby Pelican



All birds, from the beautiful to the comical, can be captured on film . . . even with a simple box camera. All it takes is a few tricks



**By Frank Tinker**

**A**NYONE WHO likes birds or photography will sooner or later try to combine the two.

If the results are less than satisfactory, it's usually because the average snapshooter has overlooked some basic facts.

A bird (1) is usually quite small, (2) is unbelievably fast and (3) doesn't trust people. The basic problem is to get close enough to this tiny creature for the resultant image to be more than a pinpoint on a negative. To do this, you must know your equipment well enough so that when the fleeting opportunity arrives for that one good picture you will make the most of it.

Let's start with the simplest methods. The window feeding station, which many thoughtful people have incorporated as part of their homes, provides an ideal setup for the amateur. The birds become accustomed to their surroundings, a window only a few feet away affords screening for the

**SOARING BIRDS** (left) can be caught with camera by following flight, snapping shutter when they fill frame; not waiting for them to fly through frame

**BABY PELICAN** (inset, left), like most fledglings, is too young to fly. Trick is to find nesting area, then move in as close as necessary (below) for photo

photographer and the birds can often be caught at rest. In this situation, you can either hold your camera, or put it on a tripod, prefocus it on the station and trip the shutter with a long cable or bulb release.

The cameras need not be expensive. Most cheaper box cameras have a fixed focus which requires that the subject be at least six feet away. Those using 35-mm. film will focus to three feet or less, and auxiliary lenses can be added to allow focusing within a few inches.

To show the range of equipment which can be built around this setup, one family has a cheap camera permanently arranged in this fashion and any time a member notices an interesting bird at the station he simply pulls the cord. Another hobbyist with a much larger pocketbook has a layout which includes an electric eye to trigger the shutter whenever a bird lands at the station, a supplementary electronic flash to light the subject and stop its motion, and a spring-loaded film-winding attachment which readies the camera for the next shot automatically.

To approach birds that do not choose to

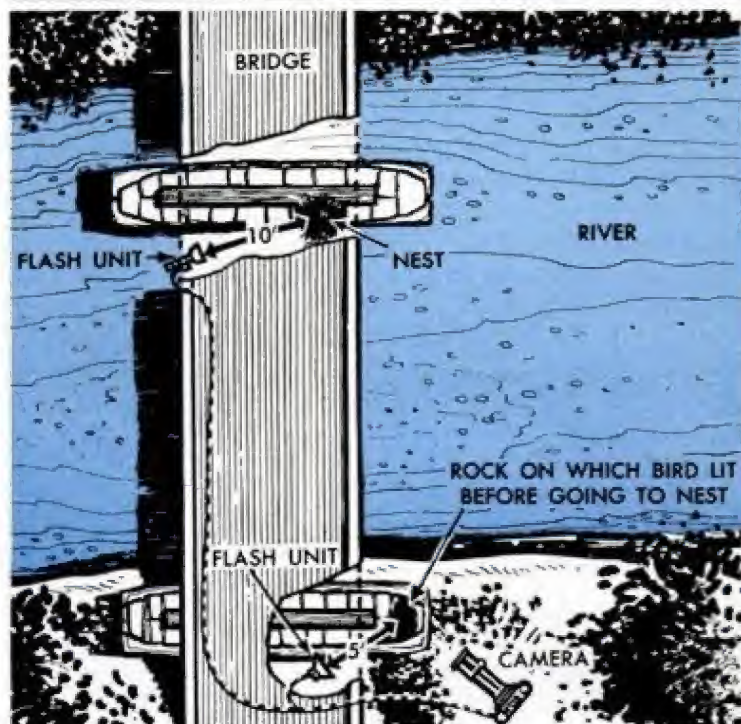




## Some birds take more study,



**BOX CAMERA** (below) can be used in bird photography. String arrangement trips shutter from remote position when bird alights at predetermined spot



**WATER OUZEL** (top) was photographed with arrangement shown in diagram. Wires attached to flash units were strung along bridge (left) to camera position



mingle with people, blinds can easily be set up in the field. They can be located near a nest or any place the quarry is known to congregate.

The blind, like your other equipment, can range from the elaborate permanent type, complete with flash reflectors angling on the bird from every angle, to a simple piece of canvas thrown over the person's head. All these blinds have a single objective—to erase the human form and its outline.

The standard blind, however, is a small tent which allows sufficient elevation for the camera and the person sitting behind it



*more equipment, more patience . . .*



**FLASH UNIT** is set up near ouzel's nest. Second unit (as shown in diagram) is set up near rock on which ouzel alights before going to nest. Arrangement was based on studies made of bird's habits before setting up equipment. Pictures were then taken at rock and at nest from same remote camera position

as well as apertures for the lens. Again, as long as the bird does not see the person, the slow movement of this lens poked out the slit in the canvas does not ordinarily frighten him. Since overhead cover is not usually essential, the simplest form of blind consists of several poles driven into the ground with a large tarp wrapped around them. Vertical slits can serve as lens windows or U-shaped flaps can be sewn over larger holes.

The last method for approaching these most elusive creatures is by optical means—binoculars, field glasses or telephoto lens.

The bird photographer is particularly fortunate today, since the recent advances such as the single-lens reflex camera, auxiliary lenses, binocular attachments and cheap telephoto lenses seem to have been designed almost specifically for him. Undoubtedly the best of these substitutes for distance are the telephoto lenses. Usually designed for 35-mm. use, a good 300-mm. or 400-mm. lens can now be purchased for well under a hundred dollars.

Using these long lenses requires a little extra care, however. The focus becomes quite critical, and the slightest movement





**MOTHER SWALLOW** feeding its young required fast shutter speed. Shore bird (above) needed telephoto lens

of the camera will tend to blur the picture. The use of a tripod or other brace is recommended whenever possible. For the same reason, a high shutter speed is usually mandatory. The rule of thumb is to use a speed to correspond with the focal length of the lens—that is, for a 400-mm. lens use  $\frac{1}{400}$  of a second, for a 200-mm. lens use  $\frac{1}{200}$ , etc.

With all this talk of speed, the question immediately arises as to whether or not an adequate exposure can be given the film. In many cases, it cannot without supple-

mentary flash. Birds seek the shade because insect food is more abundant here, because it affords protective obscuration and because most species would be unable to endure the glare of the sun indefinitely. The telephoto lens, though, has a tendency to give a soft monotone to pictures taken in shadow.

Flash lighting is the next answer to some situations found in the field. The type of flash will depend entirely on the circumstances and the type of camera. If this light

**WATER WALKER**, a coot, was caught from hidden shore position, using both fast shutter speed and telephoto







**COMPLETE OUTFIT** can cost less than \$200. Even less expensive equipment can be used for window-station rig

source can be fixed—at a nest, for instance—an electronic unit will eliminate the need for changing bulbs with every shot. The contact wires can be spliced and trailed from the photographer's blind to the unit if he intends to hold the camera, or the whole unit can be operated by remote control. A simple solenoid arrangement can be rigged to trip the shutter at distances too great for regular release cords, and even radio-controlled units are now available.

If the unit is to be carried, however, bulbs

will probably be most serviceable. Most reflex cameras using the telephoto lenses have a focal-plane shutter which can be synchronized with the electronic units only at very slow speeds. Exposure at these speeds will leave "ghost" images or worse on the negative when used in natural light. The #6 or #26 bulbs, made for focal-plane shutters, can be used at any speed and seem to reach out farther than the electronic units.

(Continued to page 212)

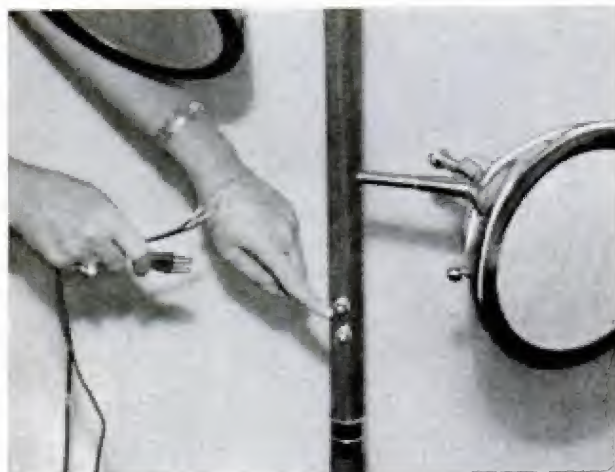
**FIELD PHOTOGRAPHY** is possible with simple canvas blind. Dancing grouse was shot from about 10 feet away







**INSIDE OF BULLET** shows speaker mounted to baffle with volume control and crossover capacitor wiring



**TWO SWITCHES** provide lamp switching and speaker On-Off. Wires in hand are for lamp and loudspeakers



**AMPLE LIGHT** is provided by unit in use, while loudspeakers are directed and volume adjusted from chair

## Speaker-Lamp Combo Package

New loudspeaker-lamp combinations provide high fidelity sound plus high styling in an assortment of combinations. The unit can be had with three speakers, two speakers plus a lamp, or one speaker and two lamps. A specially damped chamber for the low frequency loudspeaker eliminates sound reflection, allows much better low frequency response. These units can be

used with high-fidelity systems, radios, in offices and shops as well as homes, they make excellent wing speakers for expanding stereo effect.

Available in assorted finishes, the Verti-Sonic speakers are provided as pole lamps or tree lamps. \$129.95, in any combination of three lamps or speakers, with support. Lords Electronics, 10 E. Kinzie, Chicago.



**EASY TO USE CONNECTOR** makes installing new outlets a snap. Simply insert wire in hole, connection is made with no screws. 25c, Eagle Electric, L.I.C., N.Y.



**TURNOVER TURNTABLE** automatically changes records, and plays both sides of each record automatically, or with push button. Lincoln Engineering, St. Louis, Mo.



## Homemade Flying Wing

Powered by an 85 hp. engine, a home-built flying wing measures 13 feet long with an 18-foot wing-span. It can do 130 m.p.h.

Its builder, Marion Baker, is a mechanic in a rocket-testing facility of National Aeronautics and Space Administration. He claims the flying-wing design gets better performance from the engine.



## Aluminum Armor

The 37-mm. high-explosive shell whined through the air at the U.S. Army's Aberdeen, Md., Proving Ground and blasted against the weld of two sections of aluminum. Although the explosion left an ugly pockmark on the experimental armor plate, the aluminum held and thus passed the test for consideration for use in U.S. armored vehicles.

Welded aluminum alloy, it was determined, makes armor effective against small arms fire and artillery shell fragments. It offers the advantage of keeping weight down. Corrosion resistant, it also is easy to fabricate in factory and field.



## Traveling Chow

Munching "on the run" has hit the big time. The lunch truck idea, started in California during the war, is now a busy, mobile catering industry with some 6000 units.

Deluxe installations (about \$5500) are fitted to light truck chassis and offer a wide variety of snacks and light lunches from stainless steel display racks.

Butane gas is used for coffee and hot sandwiches and some units have mechanical refrigeration and small soda fountains with ice cream and charged water.

The average vender makes 25 to 40 stops daily. On his rounds, a typical owner/vender like L. G. Gershman, with changer right, serves up to 100 customers per stop. Offices, warehouses, factories and sports events are visited on a typical route. Stops at offices and industrial operations are all according to a predetermined schedule that enables a driver to arrive for coffee breaks and lunch hours.





## SHOP AND CRAFTS

**60<sup>th</sup>**  
ANNIVERSARY  
SPECIAL



**ROWING MACHINE**



**BELT MASSAGER**



**HEALTH BIKE**



**ABDOMINAL BOARD**

### **PLANS AVAILABLE**

To fulfill requests for plans for building this home exercising equipment after the magazine article is out of print, we have prepared a set of large-size plans which may be purchased from our blueprint dept. by writing Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11, and enclosing \$2.50.





*Daily workouts on these four homemade exercising machines will keep the entire family fit as a fiddle*

# HOME FITNESS GYM

**By Manly Banister**

**Part I**

**M**USCLES FLABBY? Waistline bulging? Decide now to have your own physical fitness gym by making this low-cost health-building equipment. A few minutes workout each day on any one of these body conditioners (the bike, the rowing machine, the belt massager and the abdominal board) will give you and the rest of the family a trim and healthy figure from head to toe.

In this two-part article, Part I details construction of the bike exerciser and the rowing machine. Part II will show how to build

the belt massager and the abdominal board, plus still another exerciser, a combination affair that helps firm the legs and waistline through the use of weights.

With a bike exerciser you can literally pedal your way to health. A most beneficial exercise, cycling helps firm and condition the body from the hips down. Here you can ride rain or shine in your home on a stationary exerciser built from a discarded bike.

Your first step is to scout around for a standard 26-in. bicycle. Either a boy's or girl's bike will do (I happened to have a



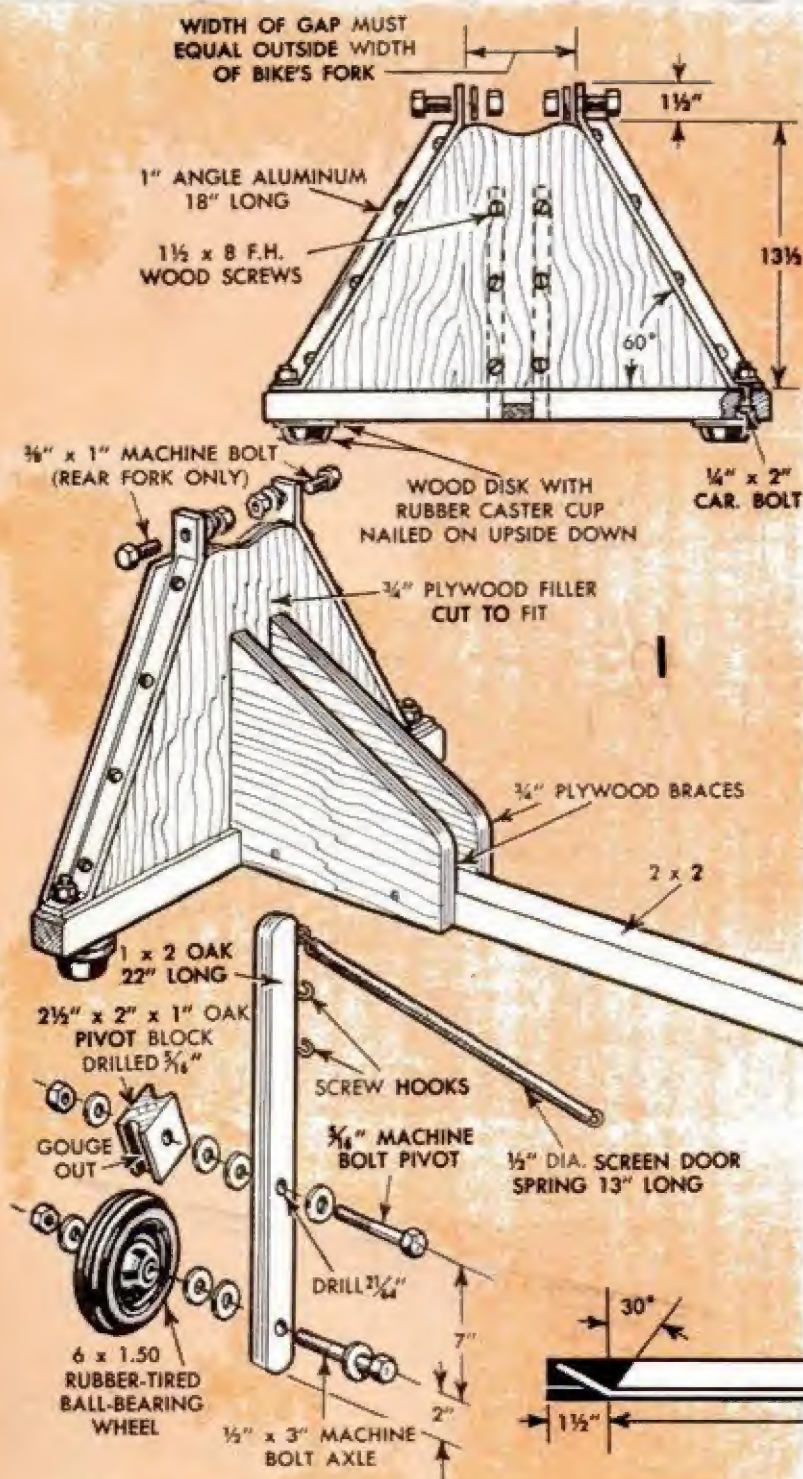


**ASSEMBLED** bike exerciser (left) ready for painting. Note rubber caster-cup feet and hooks for varying tension on friction wheel

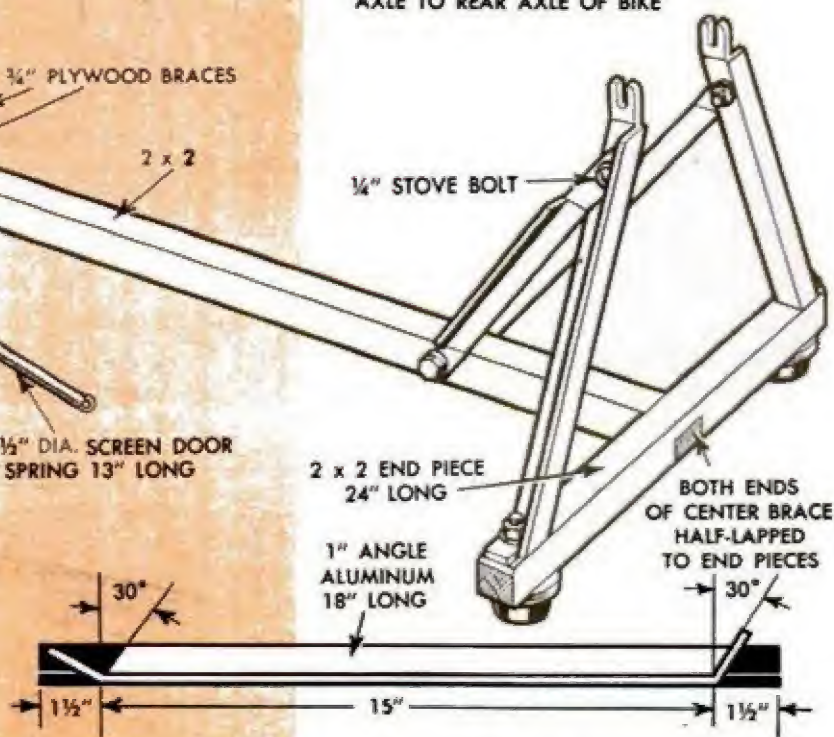
girl's bike) although the latter has the advantage of being somewhat easier for all members of the family to get on. You don't need the whole bike so turn it over on its handlebars and remove both wheels, fenders and the chain. The rear wheel is transferred to the front fork. In order to do this you will have to enlarge the axle slots which I found easy to do with a file.

Since the original chain will now be too short you will have to lengthen it by adding a second chain. This is done by taking both chains apart at their connecting links, then joining in one length. The chain is placed around the sprockets, measured for length, cut and finally made into an endless chain with a second connecting link. As there is no reason to steer the bike, the front fork is locked in a straight-ahead position by drilling a No. 7 hole through both the fork and the inner handlebar shaft and tapping the hole with a  $\frac{1}{4}$ -20 tap. A  $\frac{1}{4}$ -20 capscrew holds the front fork rigidly in line with the frame. This is all you have to do to the bike itself.

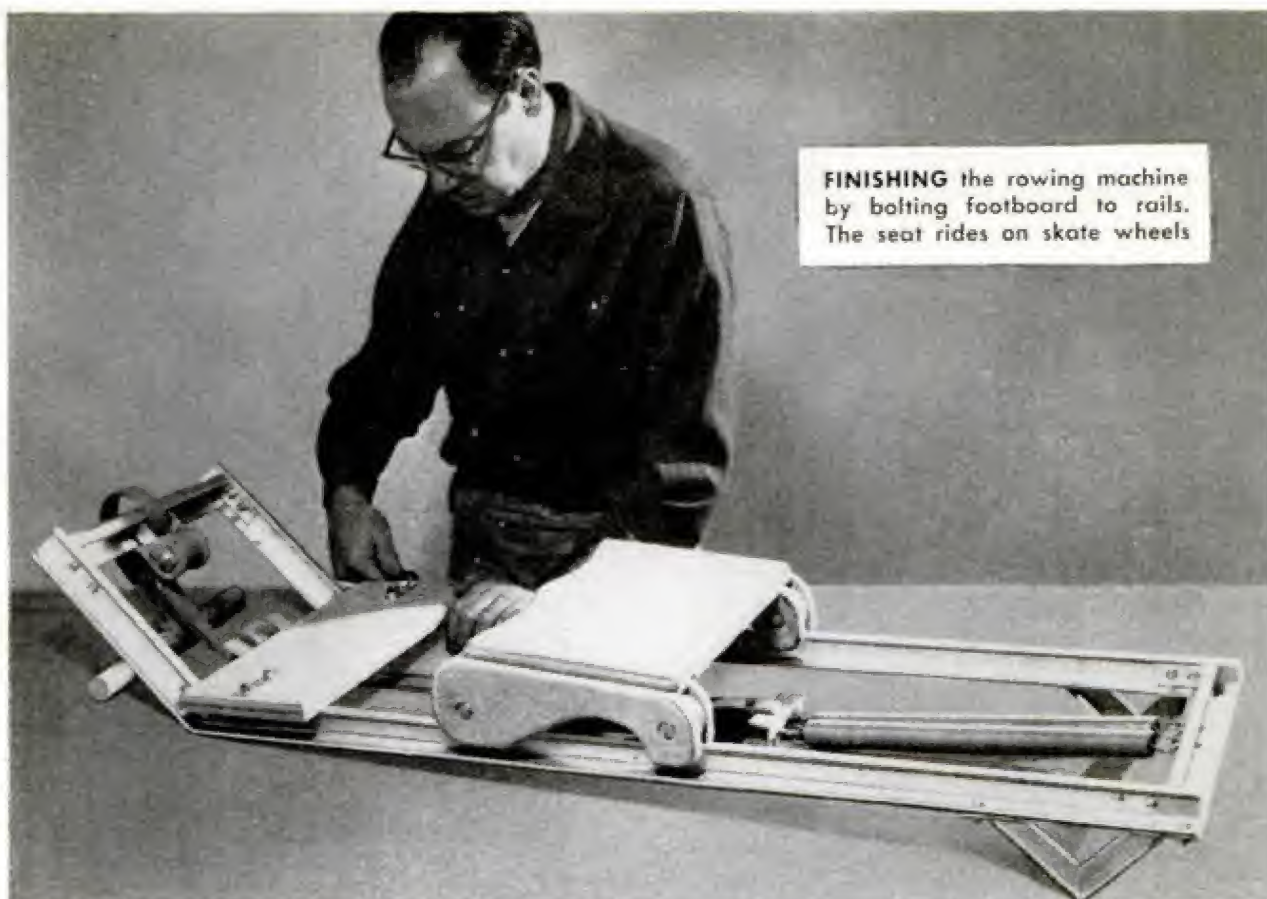
Construction of the supporting



CENTER-TO-CENTER MEASUREMENT  
EQUALS DISTANCE FROM FRONT  
AXLE TO REAR AXLE OF BIKE

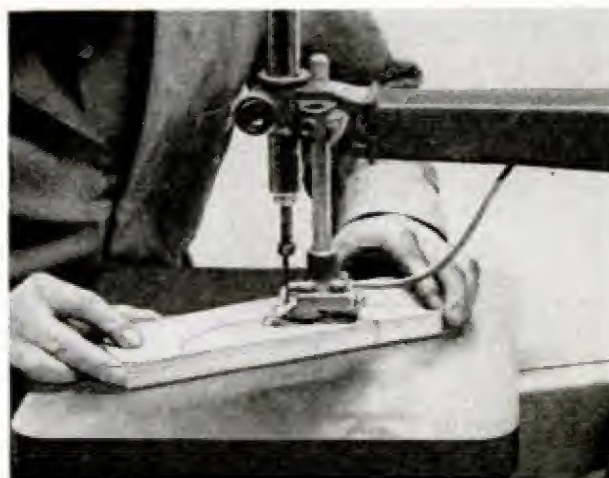




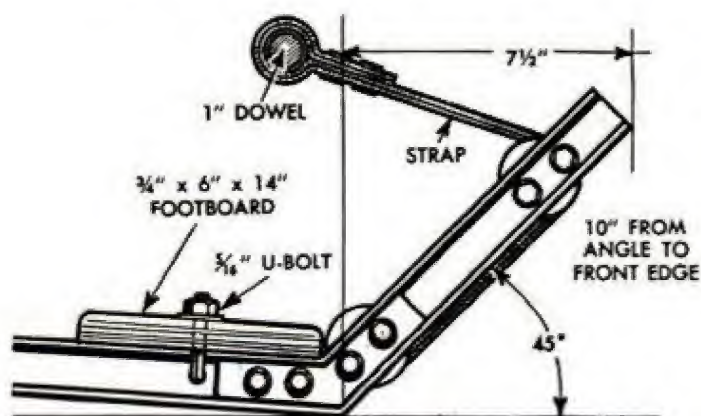


**FINISHING** the rowing machine by bolting footboard to rails. The seat rides on skate wheels

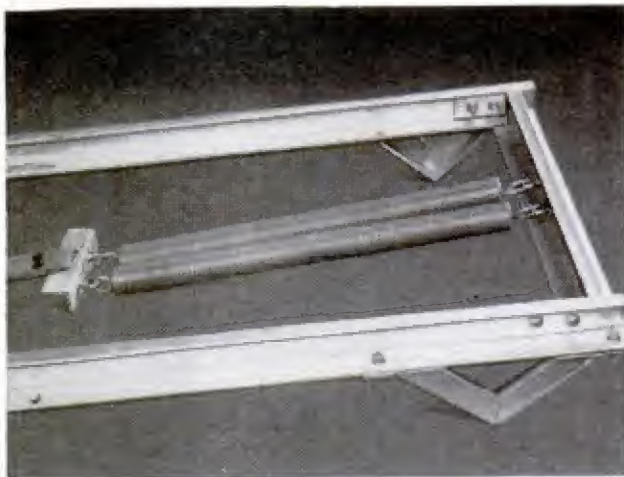
base is clearly shown in Fig. 1, along with the friction-wheel assembly. The latter is nothing more than a rubber-tired, ball-bearing wheel bolted to a 1 x 2 oak lever which in turn is pivoted to make the attached wheel bear against the front-wheel tire. Three screw hooks in the lever and a screen-door spring attached to the bike frame at the seat permits varying the tension on the friction wheel. The lower hook provides easy pedaling, the middle hook makes pumping a little tougher and the upper hook makes you feel like you're pedaling uphill. In the case of a girl's bike, the lever is pivoted to a hardwood block so shaped to wedge securely between the double tubular frame. In the case of a boy's bike, pivoting of the lever will perhaps mean drilling a hole through the frame



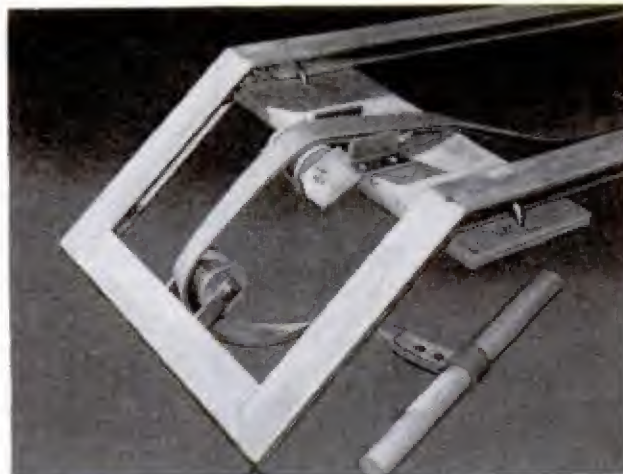
**SIDE MEMBERS** of rowing seat are jigsawed to shape (above), then shaped (below) to relieve all sharp edges. All four side members extend below rails to keep seat from coming off the track as it rolls



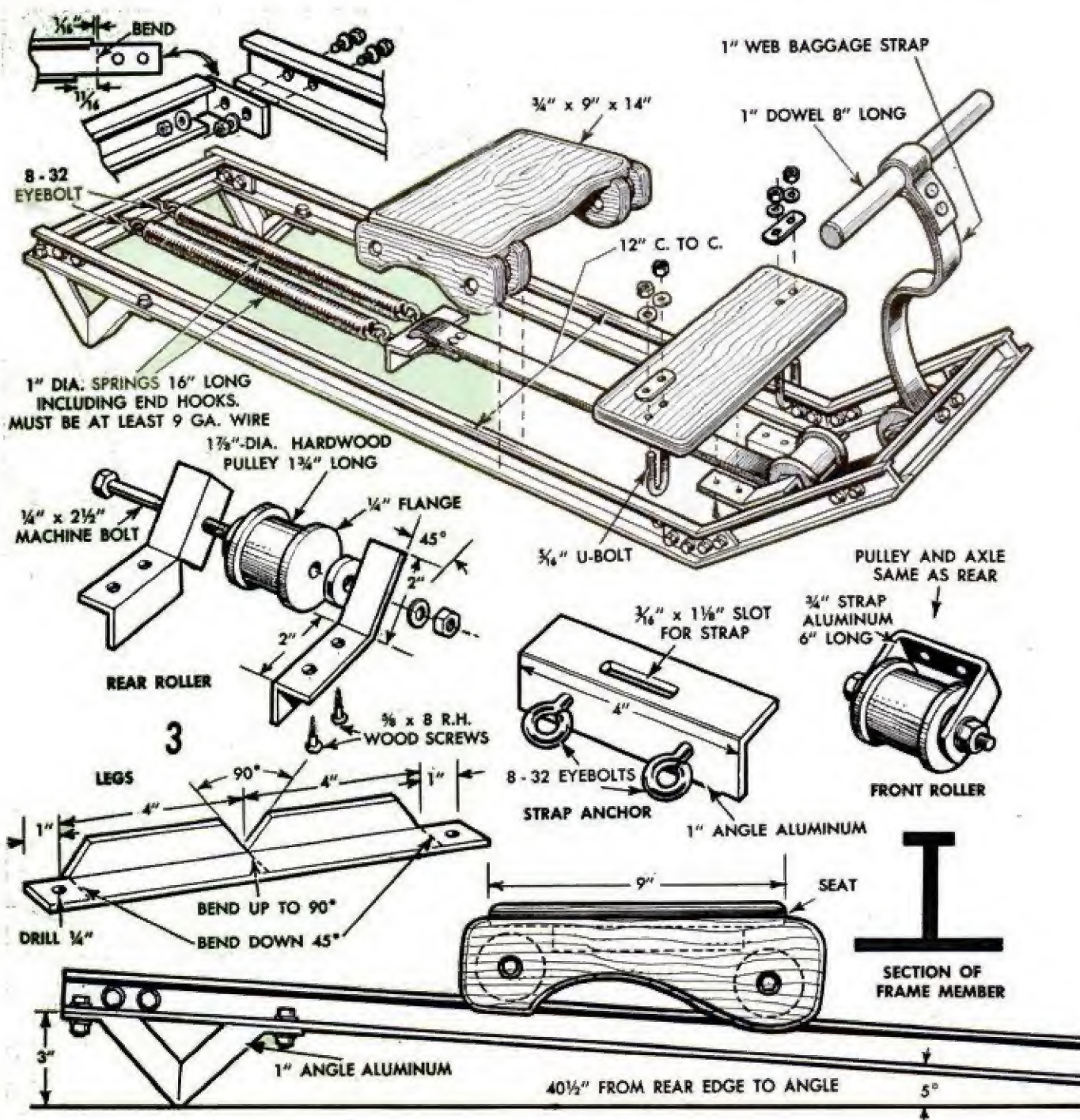




**VIEW OF FRAME** at rear of rowing machine shows how twin coil springs are attached to the pull strap



**UNDERSIDE VIEW** of rowing machine at front shows web baggage strap doubled to minimize stretching







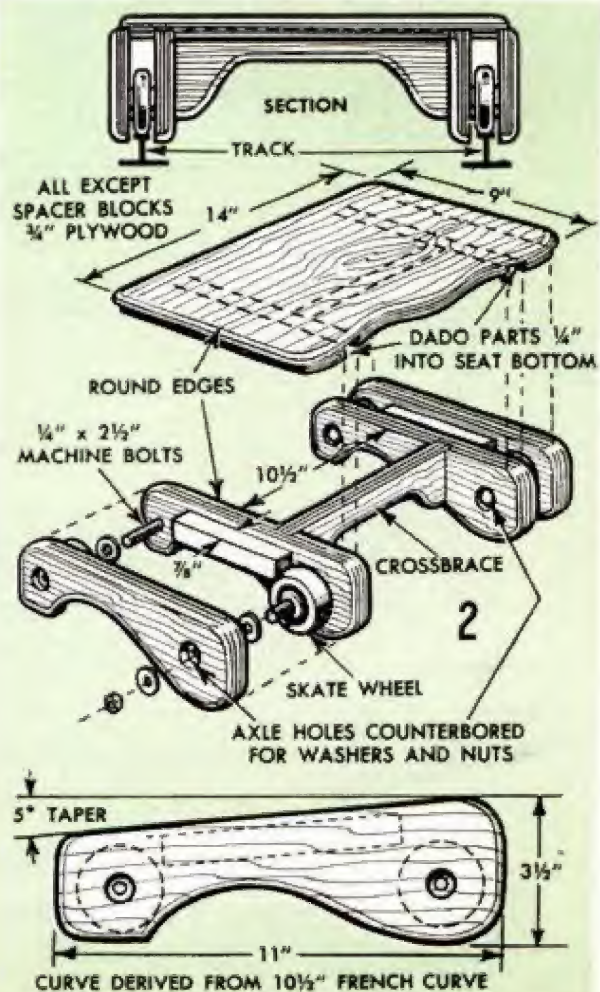
UNDERSIDE of seat shows skate wheels between the dual sides



at this point. The actual center-to-center measurement from the front axle to the rear axle of the bike determines the over-all length of the supporting base. The length and actual shape of the aluminum members which brace the two front wheel supports is found by trial in bolting and bending the members to fit. The arm of the coaster brake is anchored to the fork with the same clip originally used at the rear. This completes your bike exerciser. You'll find five minutes a day of steady pedaling will develop the thighs and calves and take the creak out of middle-age knees. By pedaling in your stocking feet you'll get the benefit of massaging the arches and balls of the feet in bearing on the pedals.

The rowing machine is a popular exerciser that simulates pulling on the oars of a rowboat. The seat, which rides free of the mechanism, rolls back and forth on the rails as a pull is exerted on two heavy coil springs attached to the rear of the frame. First study the construction details in Figs. 2 and 3. The inclined rails can be made of anything handy, even hardwood. I made mine from salvaged aluminum extrusion having a T-shape section. Aluminum angle could be used equally as well. Each spring

(Continued to page 206)

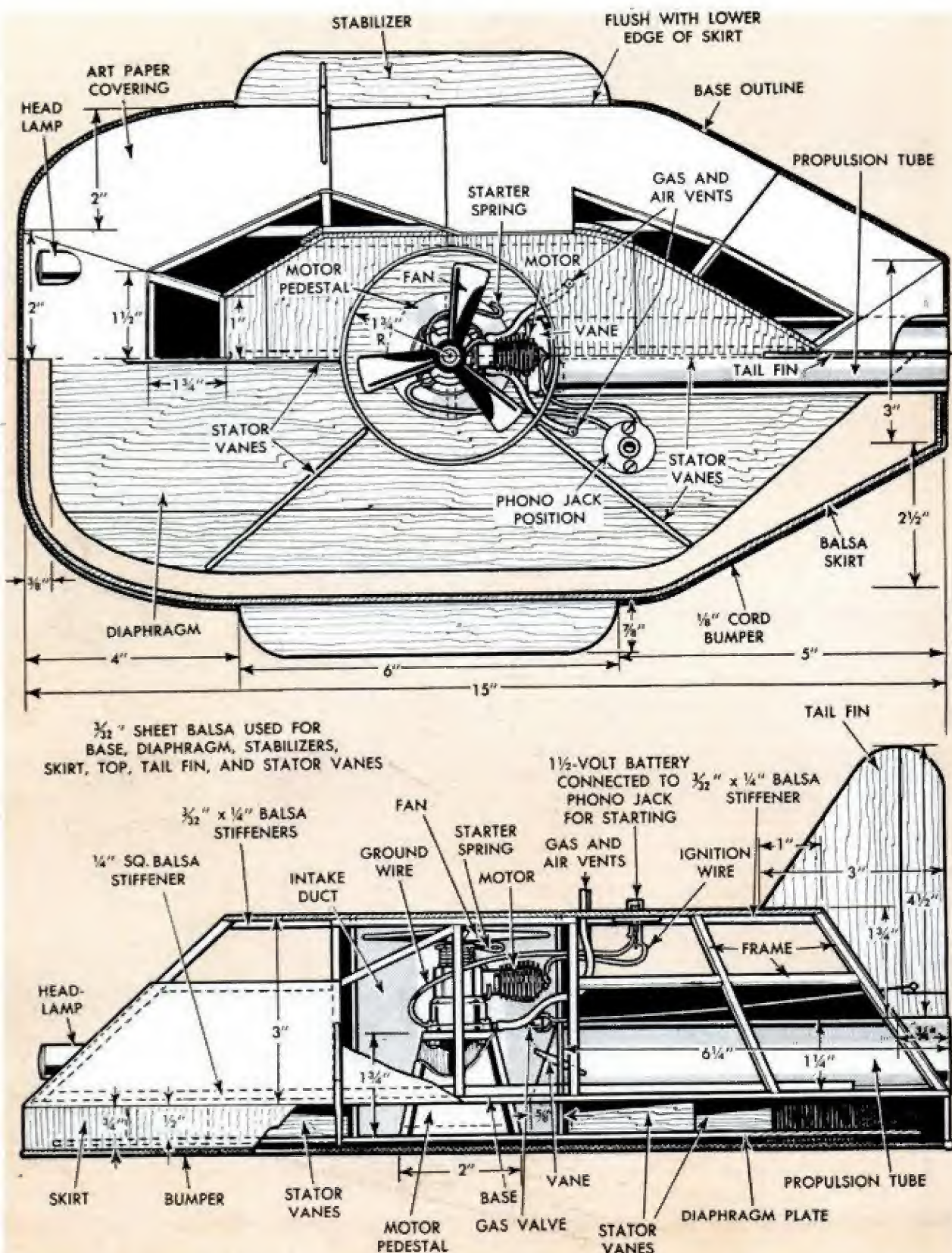




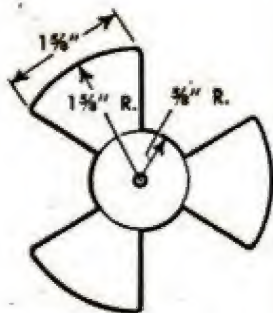
# X493

## MODEL AIR CAR OF THE FUTURE

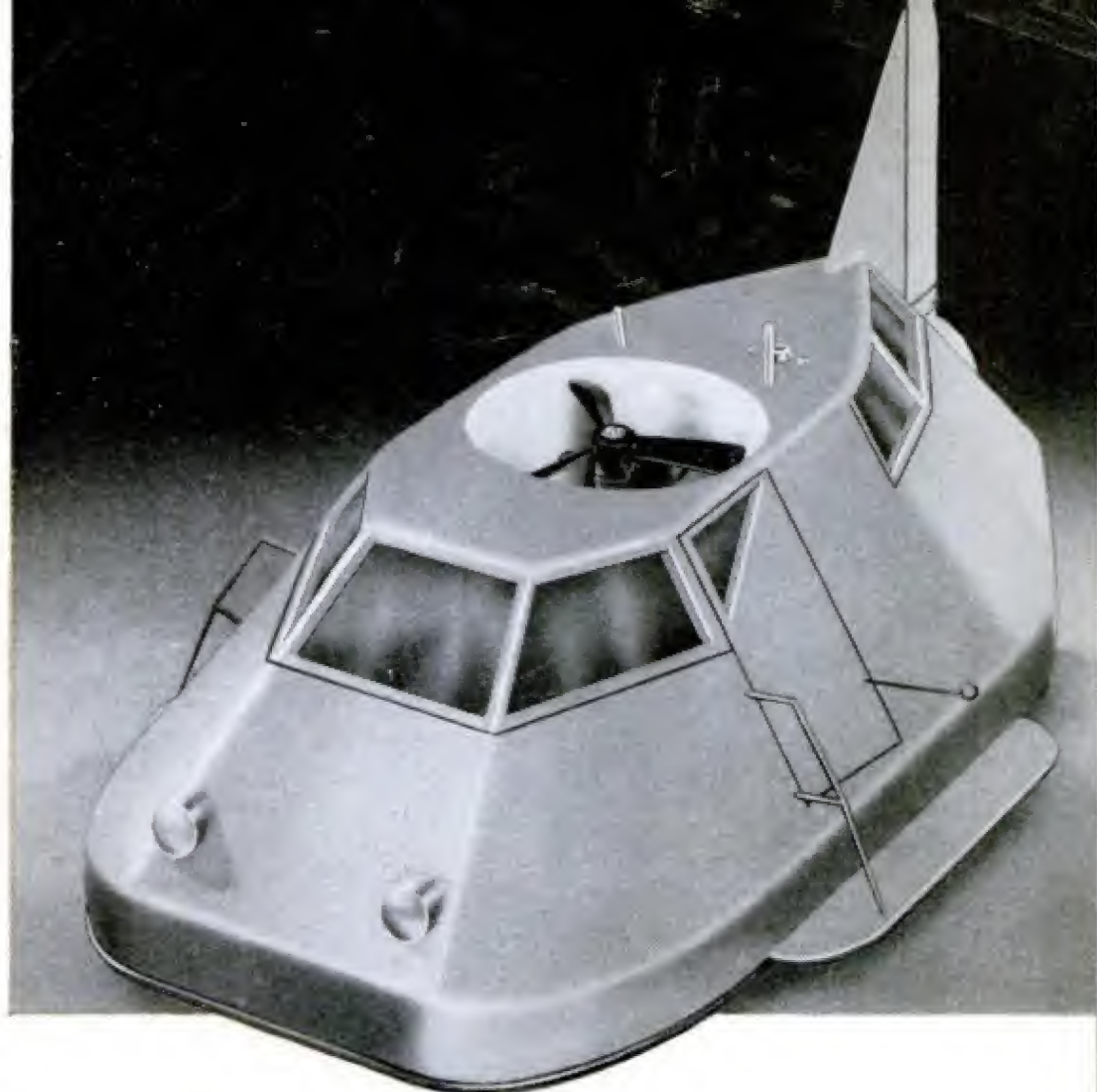
*Working model of a ground-effect vehicle rides on a cushion of air from a model-airplane engine*



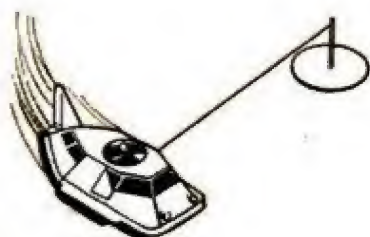




SHEET STEEL FAN



**TETHERED** to a stake the car will skim the floor around and around until the fuel runs out. Free running it will take off following a straight path  $\frac{1}{2}$  in. or so off the floor

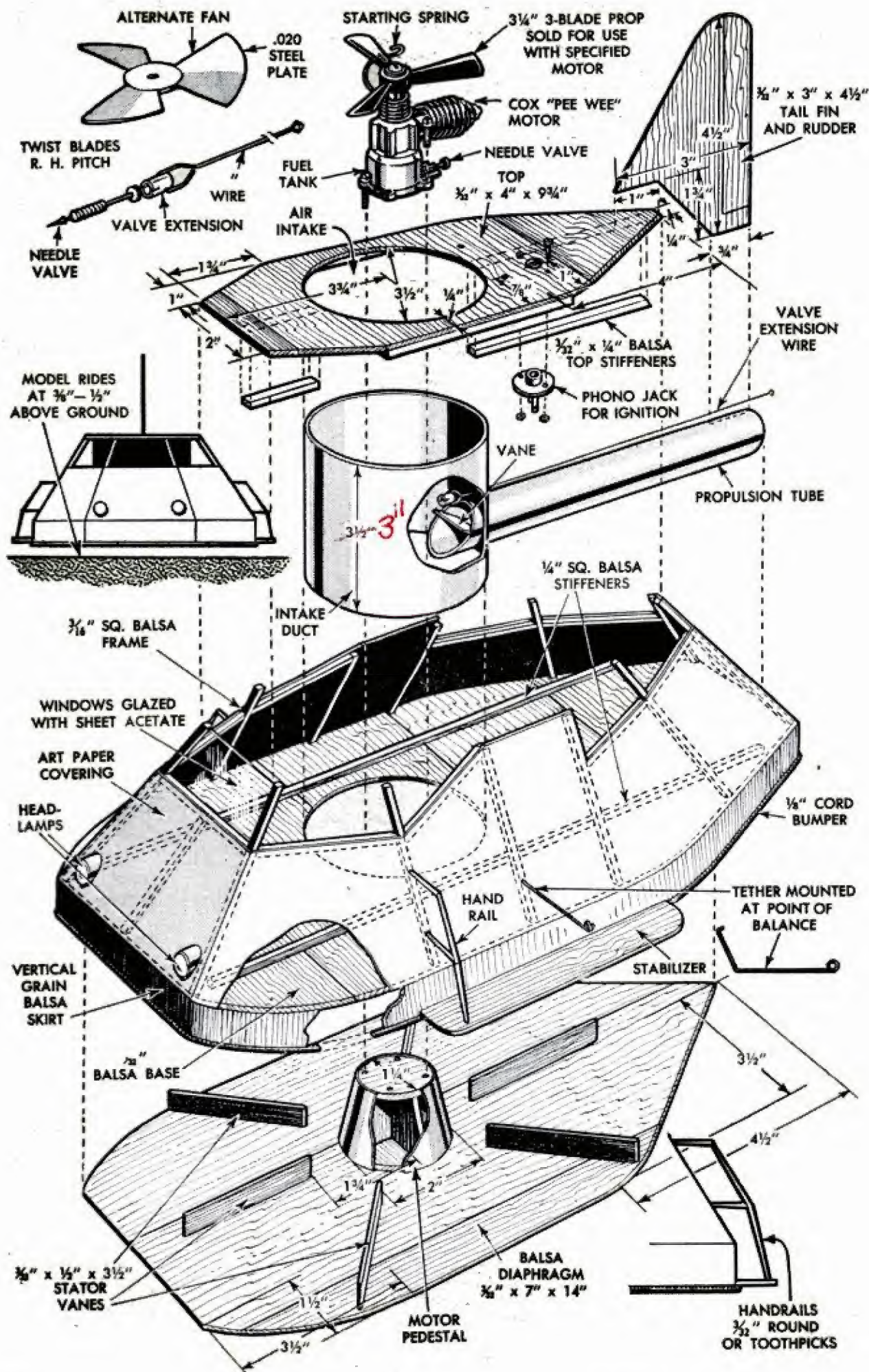


**By Roy L. Clough, Jr.**

**W**ITH A hollow whistling note audible over the whine of its tiny engine, this advanced working model of a ground-effect vehicle skims across the floor supported on a cushion of air. What makes it go?

Air is supplied by a prop to a peripheral slot which produces a high-speed wall of air around the edge of the model to retain the lift. A separate propulsion-system tube bleeds off air for reactive propulsion—from the blower section, not the skirt. Supporting pressure is not reduced—a major fault of ground-effect vehicles which propel by dumping air pressure and lifting the skirt on the opposite side from the desired direction of travel. Stabilizers on each side act somewhat like the dihedralled wings of an airplane—if the model tilts to either side, air pressure escaping from the skirt builds up under the vane and returns it to even keel. The result is a model which can buzz along at a good clip on any level surface with a minimum of sideslip due to minor irregularities on the surface. Attached to a tether it will whizz merrily around in a circle until the fuel runs out. It rides a half inch or so off the floor even when running free. Any small airplane engine can be used to power it. If you use the engine in-







stalled in the original model, which is supplied with a three-blade prop, you won't have to make a prop of sheet metal, a pattern of which is given on page 161.

First study the cutaway drawings given to become familiar with the various parts. Then begin construction by making up the base, top and diaphragm plate from edge-glued  $\frac{3}{32}$ -in. balsa sheet. Use stiffeners where shown and allow to dry on a flat surface. Make up the  $3\frac{1}{2}$ -in. intake duct from art paper and use this as the first structural member to hold the top and base together. When dry, add the  $\frac{3}{16}$ -in. uprights which form the supports for the side covering. Next install the paper propulsion tube. Note the vane to direct airflow within it.

### Use Balsa for Skirt

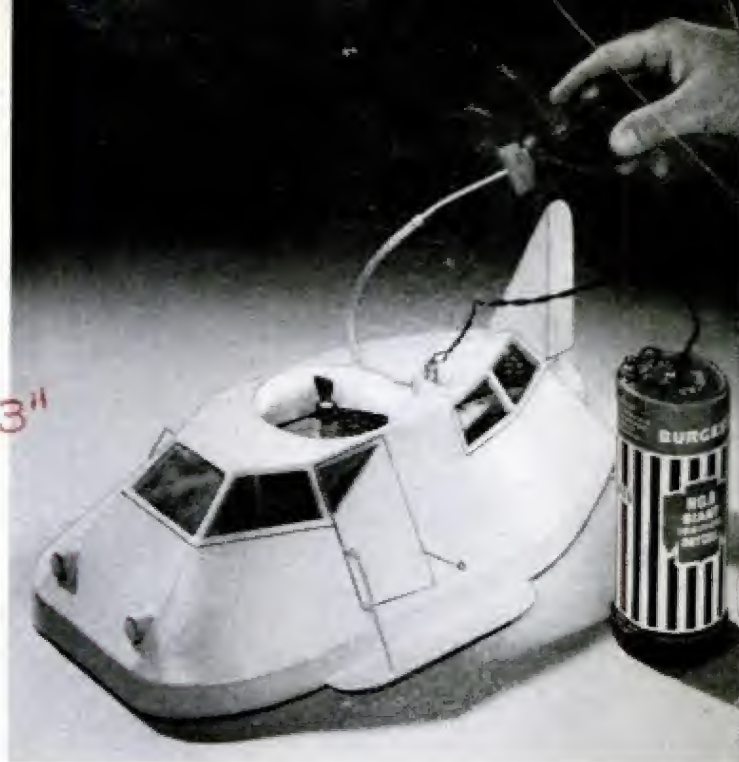
The skirt is vertical grained  $\frac{3}{32}$ -in. stock glued around the bottom edge of the base. Use basswood or balsawood and there will be no difficulty in making the bends. Cover the framework of the car body with art paper, one section at a time, beginning at the rear. Add dummy headlights and fin, stabilizing vanes and handrails. Windows may be glazed with sheet acetate or left open. Finally turn the model over and install stator vanes. Coat the interior with at least two coats of hot fuelproof dope (clear). Dope the exterior in your favorite color scheme. The original was painted light blue outside, fire red inside.

### Engine Sits on Pedestal

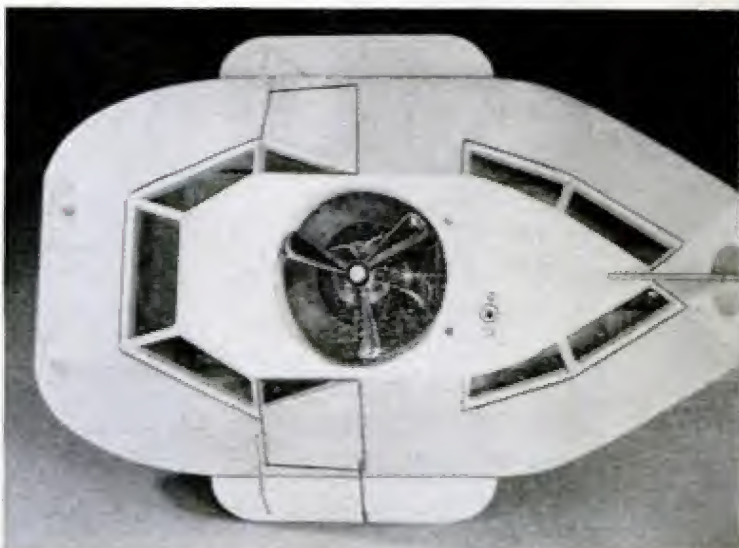
Make up the engine pedestal, mount the engine and cement the pedestal to the diaphragm plate. Three coats of clear hot fuelproof dope are advisable here. Attach lead-out wires to the glow plug. Cut out a  $3\frac{1}{4}$ -in. disk of cardboard and use this as a guide in centering the engine. Actual installation is made by cementing the diaphragm plate to the stators. Use a slow-drying cement that will allow time to even up the slot around the skirt and center the engine shaft.

Run out the fuel filler tubes and engine lead-out wires and make up a needle valve extension shaft. The glow-plug wires lead to a phonograph jack—a great convenience in starting. A recoil spring starter is a must and is installed before the prop.

A length of  $\frac{1}{8}$ -in. cord is cemented around the skirt as a buffer. (A round shoestring works very nicely.) Suspend the model by the engine shaft and balance it so that it hangs evenly. Small bits of solder, coated with cement and dropped inside the body on the light side or end will do the trick. If tethered operation is desired, cement a wire hook through the covering to the upright on the central line.



FUEL is added with squeeze bulb to plastic fuel line connecting tank. Dry cell plugs into phono jack.



TOP AND REAR views shown above and below show engine mounted in intake duct and propulsion-tube outlet at rear. Note wire hook at door for tethering





# TEE OFF With Marbles



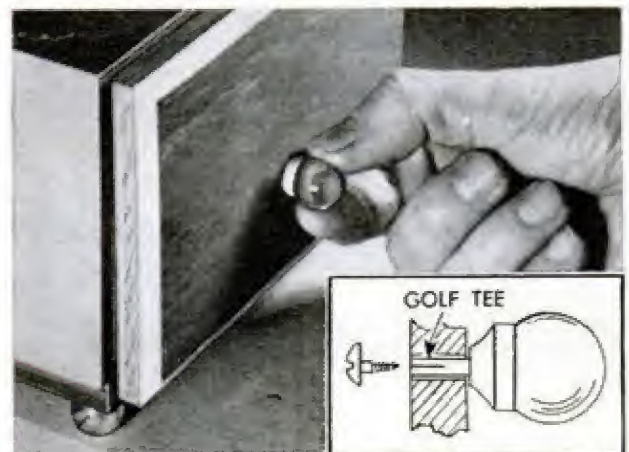
**CEMENTED IN DIMPLES** formed at corners of trinket box, marbles provide colorful ready-made ball feet

**YOU CAN PLAY** an interesting marbles "game" with colorful glass marbles, epoxy-resin cement and wooden golf tees, combining them into unusual and attractive novelties.

To make a space-age candle holder bore and taper-ream a candle socket in a 2-in. wooden ball, and opposite this socket bore three angled holes to receive the golf tees on which marbles have been cemented.

The secret of using marbles for craft work is in obtaining good adhesion between the smooth surface and mounting cement. The marbles are washed in water and detergent or in a solvent such as lacquer thinner. The two-part epoxy cement is mixed and used according to manufacturer's instructions. When attaching marbles to golf tees, hollow out the tee to match the shape of the marble.—*Walter E. Burton*

**GLASS MARBLE** makes jewel knob for small drawer by cementing to golf tee, then gluing in hole in drawer





# AGAIN IN '62...

## **New car owners get A**CT**ion with AC Fire-Ring Spark Plugs!**

Once again, AC Fire-Ring Spark Plugs are specified as original equipment on many of America's great new cars and trucks. ACs are naturally best for replacement, too.

There is just one way to assure yourself of the reliable, factory-new quality of AC Fire-Rings. Demand them by name — their *only* name! AC makes no "second line" to sell under another label. AC's rigid quality standards will not permit it.

When you need new spark plugs, consult your AC Dealer. He's a service expert with the knowledge and experience to select the exact spark plug which will give your particular car more pep and power. You'll find a new set of ACs can save you real money on gas, too.

Remember, you get them from your AC Dealer. If you care about your car, he's a mighty good man to know!

*an exclusive brand of*  
**you get A**CT**ion with**



**FIRE-RING  
SPARK PLUGS**



# 1962 FIND-BY-COLOR SPECS

## COMPACTS (100 to 114-Inch wheelbase)

N.A.—Not available at time of publication

### POPULAR MECHANICS

	Lowest Price Four Door	Shipping Weight	Wheelbase	Length	Width	Height	Ground Clearance	Turning Circle (ft. curb to curb)	Steering Ratio ( : 1)	Turns (lk to rk)	Front & Rear Legroom	Front & Rear Elbowroom	Front & Rear Headroom	Displacement	Horsepower	Comp. Ratio	Torque	Bore & Stroke	Fuel Tank	Manual	Automatic	Overdrive
Covair 500, 700 Six	2111	2370	108	180	47	51.5	6	39.3	23.5	5	44.0-36.5	58.5-57.0	34.0-32.5	145	80	8.0	124	3.43x2.60	14	3.27	3.27	...
Monza Six	2273	2415	108	180	47	51.5	6	39.3	23.5	5	44.0-36.5	58.5-57.0	34.0-32.5	145	102	9.0	134	3.43x2.60	14	3.27	3.27	...
Palco 144 Six	2047	N.A.	109.5	181	70.8	54.5	5.9	38.8	27	4.6	44.9-40.3	57.1-57.0	38.9-37.3	144	90	8.7	138	3.50x2.50	14	3.10	3.50	...
170 Six	2084	N.A.	109.5	181	70.8	54.5	5.9	38.8	27	4.6	44.9-40.3	57.1-57.0	38.9-37.3	170	101	8.7	156	3.50x2.94	14	3.20	3.50	...
Plymouth Valiant V-100 (170)	1991	2540	106.5	184.2	70.4	53.4	5.4	36.4	24	5.3	42.8-39.8	56.8-56.9	37.9-37.4	170	101	8.2	155	3.40x3.13	14	3.55	3.23	...
V-200 (325)	2087	2495	106.5	184.2	70.4	53.4	5.4	36.4	24	5.3	42.8-39.8	56.8-56.9	37.9-37.4	225	145	8.2	215	3.40x4.125	14	3.55	2.93	...
Chevy II 100, 300 Four	2041	2430	110	183	70.8	55	6	38.4	25.4	4.7	43.5-38.5	59.0-59.0	39.0-38.0	153	90	8.5	132	3.88x3.25	16	3.08	3.36	...
Nova 400 Six	2324	2530	110	183	70.8	55	6	38.4	25.4	4.7	43.5-38.5	59.0-59.0	39.0-38.0	194	120	8.5	177	3.56x3.25	16	3.08	3.08	...
Mercury Comet 144	2139	2544	114	194.8	70.4	54.5	5.9	39.0	27	4.6	44.9-40.3	57.1-57.0	38.9-37.6	144	85	8.7	134	3.50x2.50	14	3.50	3.50	...
170	2176	2550	114	194.8	70.4	54.5	5.9	39.0	27	4.6	44.9-40.3	57.1-57.0	38.9-37.6	170	101	8.7	156	3.50x2.94	14	3.50	3.50	...
Buick Special V6	2358	2639	112	188.4	71.3	52.8	5	38.1	26.2	5	44.6-38.9	58.6-58.2	34.0-33.7	198	135	8.8	205	3.62x3.20	16	3.36	3.08	...
Special Deluxe V8	2593	2579	112	188.4	71.3	52.8	5	38.1	26.2	5	44.6-38.9	58.6-58.2	34.0-33.7	215	185	10.25	220	3.50x2.80	16	3.36	3.08	...
Pontiac Tempest Four	2240	2816	112	189.3	72.2	53.6	6	37.7	24	4.25	44.1-37.8	58.6-58.3	34.0-33.7	194.3	110	8.6	190	4.06x3.75	16	3.31	3.08	...
Tempest Deluxe V8	2456	2975	112	189.3	72.2	53.6	6	37.7	24	4.25	44.1-37.8	58.6-58.3	34.0-33.7	215	185	10.25	230	3.50x2.80	16	3.31	3.08	...
Oldsmobile F-85 V8	2457	2598	112	188.2	71.6	52.7	5	37	26.2	5.2	44.0-37.8	58.6-58.2	34.0-33.6	215	155	8.75	210	3.50x2.80	16	3.08	3.23	...
F-85 Deluxe V8	2592	2626	112	188.2	71.6	52.7	5	37	26.2	5.2	44.0-37.8	58.6-58.2	34.0-33.6	215	155	8.75	210	3.50x2.80	16	3.08	3.23	...
Dodge Lancer Six (170)	2011	2535	106.5	188.8	72.3	53.4	5.5	36.3	24	3.3	42.2-39.4	56.8-56.9	33.9-33.8	170	101	8.2	155	3.40x3.12	14	3.55	2.93	...
Lancer Six (325)	2114	2550	106.5	188.8	72.3	53.4	5.5	36.3	24	3.3	42.2-39.4	56.8-56.9	33.9-33.8	225	145	9.0	215	3.40x4.12	14	3.55	2.93	...
Rambler American Deluxe Six	1896	2500	100	173.1	70	56.1	6.3	36	27.5	3.92	44.0-37.8	58.0-45.3	35.0-33.0	195.6	90	8.0	160	3.13x4.25	20	3.31	3.31	3.78
Deluxe "400" Six	2089	N.A.	100	173.1	70	56.1	6.3	36	27.5	3.92	44.0-37.8	58.0-45.3	35.0-33.0	195.6	125	8.7	180	3.13x4.25	20	2.87	2.87	3.31
Rambler Classic Six	2349	2940	108	190	72.4	57.5	7	37.5	28.0	3.62	43.6-40.3	59.7-60.4	36.0-34.5	195.6	127	8.7	180	3.13x4.25	20	3.78	3.31	4.11
Ambassador V8	2603	3275	108	190	72.4	57.5	7	37.5	28.0	3.62	43.6-40.3	59.7-60.4	36.0-34.5	227	250	8.7	340	4.00x3.25	20	3.54	2.87	3.54
Studebaker Lark Deluxe Six	2040	2760	113	188	71.3	55.8	6.1	39	VAR.	4.7	43.5-40.0	59.5-59.0	35.3-34.8	170	112	8.0	154	3.00x4.00	18	3.73	3.73	4.10
Lark Regal V8	2325	3025	113	188	71.3	55.8	6.1	39	VAR.	4.7	43.5-40.0	59.5-59.0	35.3-34.8	259.2	180	8.25	260	3.56x3.25	18	3.07	3.07	3.31

## FAMILY SIZE (115 to 117-Inch wheelbase)

Plymouth Savoy Six	2262	2960	116	202	75.4	54	5	40.3	28.7	5.3	46.0-40.9	60.8-61.0	38.0-37.8	225	145	8.2	215	3.40x4.12	20	3.31	2.93	...
Belvedere V8	3006	3120	116	202	75.4	54	5	40.3	28.7	5.3	46.0-40.9	60.8-61.0	38.0-37.8	318	230	9.0	340	3.91x3.31	20	3.55	2.76	...
Fury V8	2670	3265	116	202	75.4	54	5	40.3	28.7	5.3	46.0-40.9	60.8-61.0	38.0-37.8	318	260	9.0	345	3.91x3.31	20	3.55	2.76	...
Ford Fairlane Six	N.A.	2794	115.5	197	71	55.5	6.0	39.5	27.6	4.3	46.7-41.4	58.6-58.6	39.0-38.0	170	101	8.7	156	3.50x2.94	16	3.60	3.20	...
Fairlane 500 V8	N.A.	2921	115.5	197	71	55.5	6.0	39.5	27.6	4.3	46.7-41.4	58.6-58.6	39.0-38.0	221	143	8.5	217	3.50x2.94	16	3.25	3.00	3.50
Mercury Meteor Six	N.A.	2874	116.3	203.8	71.3	56.1	6.3	39.5	27.6	4.3	46.7-41.4	58.6-58.6	39.0-38.0	170	101	8.7	156	3.50x2.94	16	3.50	3.25	...
Meteor V8	N.A.	2949	116.5	203.8	71.3	56.1	6.3	39.5	27.6	4.3	46.7-41.4	58.6-58.6	39.0-38.0	221	143	8.5	217	3.50x2.94	16	3.25	3.00	3.50
Dodge Dart Six	2297	3010	116	202	76.5	53.7	5	40.3	28.7	5.3	46.0-39.1	60.8-61.0	35.2-33.5	225	145	8.2	215	3.40x4.12	20	3.31	2.93	...
Dart V8	2404	3155	116	202	76.5	54.1	5	40.3	28.7	5.3	46.0-39.1	60.8-61.0	35.2-33.5	318	230	9.0	340	3.91x3.31	20	3.55	2.76	...

## FULL SIZE (119 to 126-Inch wheelbase)

Chevrolet Biscayne Six	2378	3460	119	209.6	79	55.5	6.5	40.7	28	5.8	45	42	63.5-63.5	34.5-34	285.5	135	8.25	217	3.56x3.94	20	3.36	3.36	3.70
Belair V8	2617	3460	119	209.6	79	55.5	6.5	40.7	28	5.8	45	42	63.5-63.5	34.5-34	283	170	8.5	275	3.87x3.00	20	3.36	3.36	3.70
Impala V8	2769	3485	119	209.6	79	55.5	6.5	40.7	28	5.8	45	42	63.5-63.5	34.5-34	327	250	10.5	350	4.00x3.25	20	3.36	3.36	3.70
Ford Galaxie Six	2507	N.A.	119	209.3	79.2	54.8	5.5	41.2	30	5.5	46.4-42.4	62.1-63.5	38.4-37.6	225	135	8.4	200	3.62x3.60	20	3.56	3.56	3.89	
Galaxie 500 V8	2776	N.A.	119	209.3	79.2	54.8	5.5	41.2	30	5.5	46.4-42.4	62.1-63.5	38.4-37.6	292	175	8.8	279	3.75x3.30	20	3.56	3.00	3.89	
Mercury Monterey Six	2745	4016	120	215.5	79.5	54.9	5.6	41.6	30	5.5	46.4-42.4	62.1-63.5	38.4-37.6	225	138	8.4	203	3.62x3.60	20	3.56	3.56	...	
Monterey V8	2846	N.A.	120	215.5	79.5	54.9	5.6	41.6	30	5.5	46.4-42.4	62.1-63.5	38.4-37.6	292	170	8.8	279	3.75x3.30	20	3.56	3.00	...	
Buick LeSabre V8	3227	4126	123	214.1	78	56.3	5.5	44	33	5	44.8-41.4	63.3-63.2	34.4-34.2	401	280	10.25	424	4.18x3.64	20	3.36	2.76	...	
Invicta V8	3667	4330	123	214.1	78	56.3	5.5	44	33	5	44.8-41.4	63.3-63.2	34.4-34.2	401	325	10.25	445	4.18x3.64	20	3.90	3.23	...	
Electra 225 V8	4051	4167	126	220.1	78	57	5.7	44	33	5	44.8-44.0	63.3-63.2	34.4-34.2	401	325	10.25	445	4.18x3.64	20	3.90	3.23	...	
Pontiac Catalina V8	2796	3939	120	211.6	78.6	55.9	6	42.8	24	5.5	45.3-41.6	63.3-63.3	34.5-34.4	389	215	8.6	390	4.06x3.75	25	3.23	2.69	...	
Star Chief V8	3097	4054	123	218.6	78.6	54.5	6	42.8	24	5.5	45.3-41.6	63.3-63.3	34.5-34.4	389	215	8.6	390	4.06x3.75	25	3.23	2.69	...	
Bonneville V8	3425	4122	123	218.6	78.6	54.5	6	42.8	24	5.5	45.3-41.6	63.3-63.3	34.5-34.4	389	235	8.6	402	4.06x3.75	25	3.42	3.23	...	
Grand Prix V8	3496	3984	120	211.6	78.6	54.5	6	42.8	24	5.5	44.5-40.4	63.5-63.2	34.8-33.8	389	303	10.25	425	4.06x3.75	25	3.42	3.23	...	
Oldsmobile Dynamic 88 V8	2997	4031	123	213.9	77.9	55.8	5.6	43	33	6.1	44	41.4	63.3-63.3	34.5-34.4	394	280	10.25	430	4.13x3.07	20	3.42	2.87	...
Super 88 V8	3273	4057	123	213.9	77.9	55.8	5.6	43	33	6.1	44	41.4	63.3-63.3	34.5-34.4	394	330	10.25	440	4.13x3.07	20	3.42	2.87	...
88	3984	4261	126	220	77.9	56.6	5.8	43	33	3.6	44.5-44.3	63.6-63.2	34.5-34.4	394	330	10.25	440	4.13x3.07	20	3.42	2.87	...	
Chrysler Newport V8	2964	3720	122	214.9	79.4	55.2	5.2	42.7	24	5.3	45.8-40.6	63.8-62.8	37.8-38.1	361	265	9.0	380	4.12x3.38	23	3.23	2.93	...	
300 V8	3400	3810	122	214.9	79.4	55.2	5.2	42.7	24	5.3	45.8-40.6	63.8-62.8	37.8-38.1	383	305	10.0	410	4.25x3.38	23	3.23	3.23	...	
New Yorker V8	4128	3950	126	219.3	79.4	55.4	5.2	46.5	13.7	3.5	45.8-40.6	63.8-62.8	37.8-38.1	413	340	10.0	450	4.18x3.75	23	2.93	3.23	...	

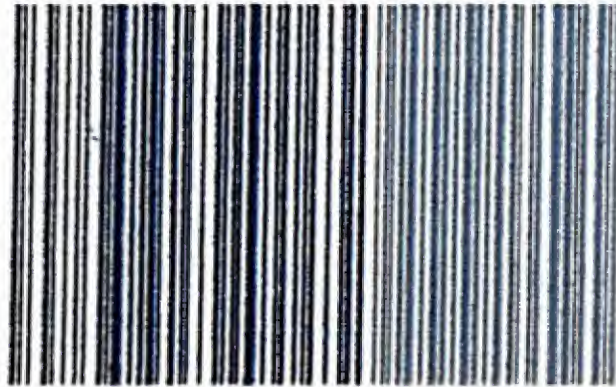
## LUXURY

Cadillac 62 V8	5213	4590	129.
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1. Follow instructions on the other side

Inverted Back



GbsSlipBack-0018

Back

1. Follow instructions on the other side



4. Close the page and slip-sheet



## WORKSHOP HELPERS

### Glue Spreader

You'll get a better glue joint when joining large surfaces if you apply the glue with a spreader. Remove the napped cover from a screen painter and substitute a section cut from a 1½-in. cardboard mailing tube. Then pour a small quantity of glue on a piece of glass and charge the roller from this. Apply with sweeping strokes and roll out to a uniform film as in painting.—*Ken Murray*



### Handles With Flair

Needle files have knurled shanks, or tangs, which serve as handles for all ordinary jobs but when you're doing some types of work requiring extraordinary precision they often are inadequate and tiring. A larger handle also makes the tiny files easier to control in close quarters. Wooden clothespins are readymade for this purpose. Drill a hole in the end of the pin the same diameter as the tang of the file, squirt in a drop or two of cement and press the tang tightly into the hole. Just split the clothespin if you need to remove it.

—*Martin D. Koehler*



### Nail Starter

Carpenters start nails in places out of reach of both hands simply by placing the head of the nail against the cheek of the hammer and holding it in position with the thumb and third finger. Looks simple but when you try it you may find your fingers all thumbs. But without the carpenter's skill you can still turn the trick by cutting a piece of rubber from an inner tube slitting it near the center and cementing the ends to the hammer cheek as pictured. Just slip the head of the nail through the slit and it will be held in position for starting.



### Edge Tester

Old-timers tested the keenness of the cutting edge on a hand tool by nicking a thumbnail. If the edge was acceptably sharp, it would trim the nail easily. Unless you're skilled at this sort of thing it's not recommended. A better way is to use a scrap of clear plastic in the manner pictured. There's no danger of a slip and a badly cut finger and the plastic gives a good indication of the keenness of the edge. If the tool will trim a paper thin shaving from the plastic, you can be sure it's sharp enough for all practical purposes.





# **TRIPLE-TOP FUN TABLE**

**By John Jefchak**

## **PART II**

**N**OW THAT you are well into the construction of the pool-table top of the fun table, the next step is making and installing the filler blocks which rough-in the side and end pockets. Figs. 13, 14, 16 and 17 give the sizes of these blocks and show where and how they fit into the assembly. Note that the side-pocket filler blocks fit flush into the side-pocket openings already cut in the particle-board bed, Figs. 13 and 14, but that the corner-pocket fillers are fitted and glued in the open corners above the bed shelves, Fig. 17, the right-hand detail. The corner fillers are made by sandwiching and gluing three pieces of  $\frac{3}{4}$ -in. stock, then squaring to the over-all size given and bandsawing to a 2-in. radius as in Fig. 16.

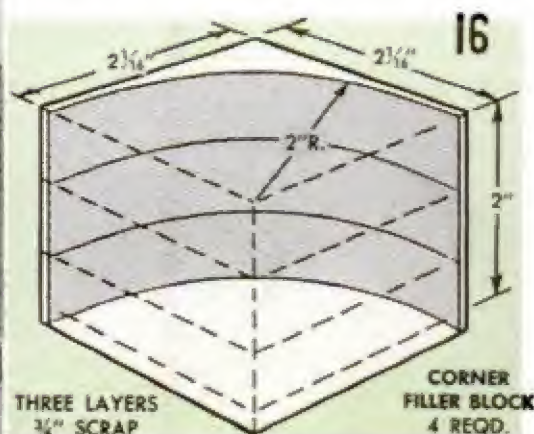
Coming up next are the fillets, Fig. 19. The fillets for the head-corner pockets (those at the end of the table opposite the ball-return opening) are shaped as in the

upper detail in Fig. 19. These serve to give the balls that drop into the head pockets the initial start along the tunnels and into the return at the opposite end of the table. Now note the corner fillets in Fig. 19. The part A, Fig. 19, serves as a deflector for balls coming down the long side tunnels from the head and side pockets, and must be made right and left hand. The whole assembly, including the fillets and deflectors, prevents balls from lodging in the corners. These parts are glued in place. Now the bottoms of the ball returns are covered with flexible countertop material. This material which dampens the sound of the rolling ball, is cemented in place with contact cement and it's important to make sure that it takes the curvature of the round-bottom groove in the ball return.

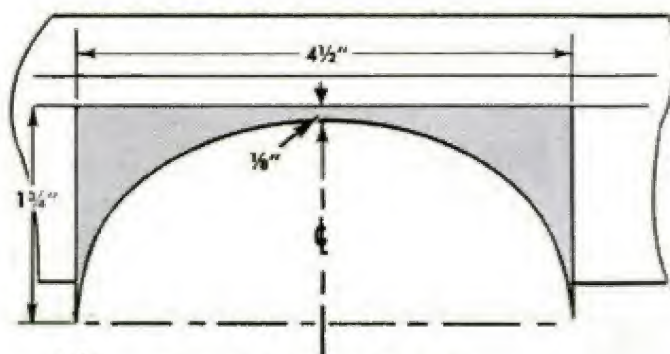
At this stage you can cover the particle-board bed with felt, or billiard cloth. You should first position the bed beforehand and



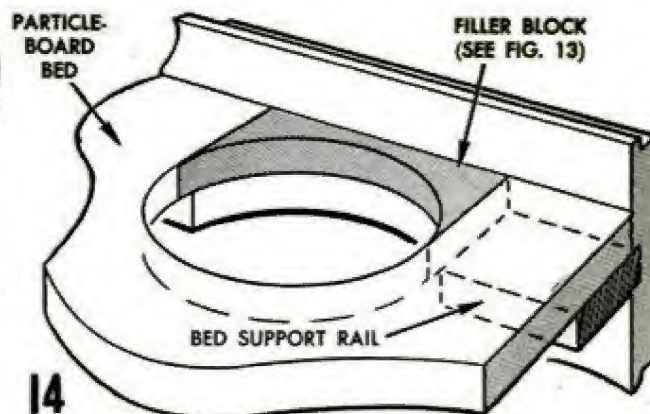
**BALLS IN PLAY** that drop into side and corner pockets are automatically returned to the ball-return opening in the end rail of the table, pictured above and at the left. Balls are easily reached through opening



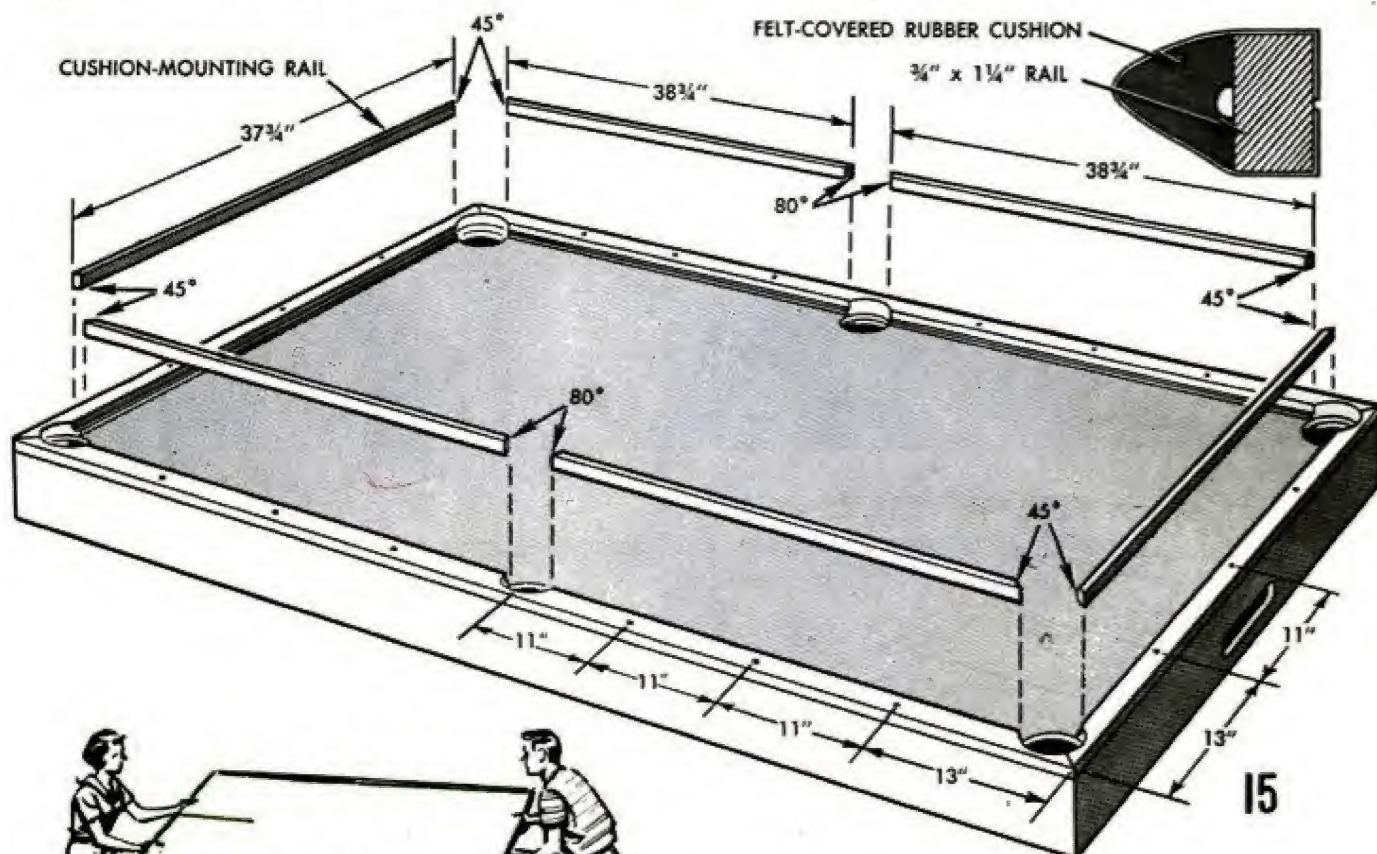




**13** FILLER BLOCK FOR SIDE POCKET CUT FROM  $\frac{3}{4}$ " PLYWOOD SCRAP



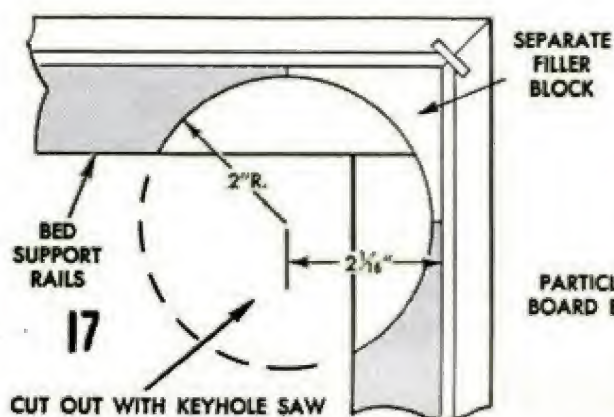
**14**



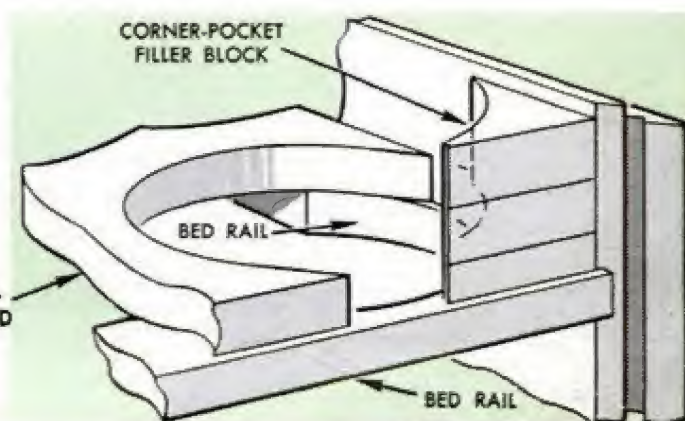
**15**



FILLER BLOCKS for side and corner pockets are shown in position in Figs. 13, 14 and 17 while the cushion-mounting rails are dimensioned above and also in Part. I, Fig. 3. If you tire of billiards, simply place the table-tennis top over the billiard table as at left

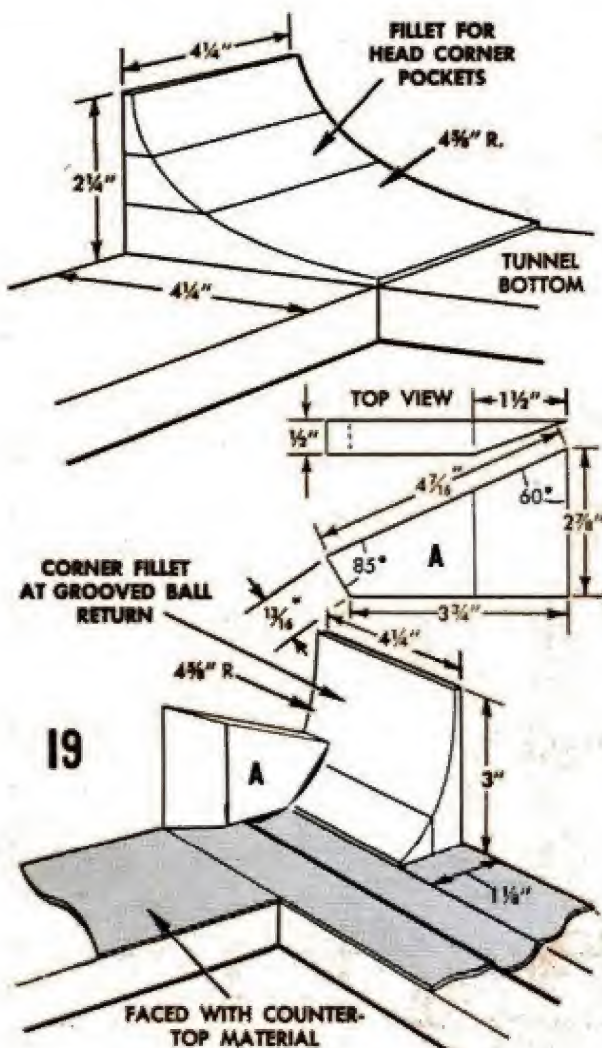
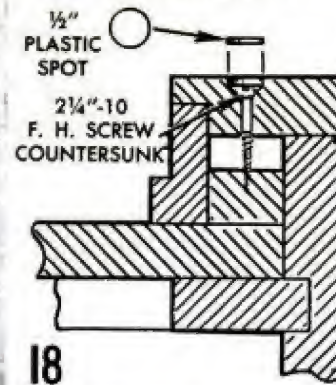


**17**





**TRIAL ASSEMBLY** of the several parts of the table rail is pictured below and detailed in Fig. 18. For a sectional view of complete assembly see Fig. 3, Part I



fasten it temporarily to the shelf members with one screw on each side of each pocket. Once done it is removed. Cut the cloth about 2 in. larger each way than the overall size of the bed. Position the felt, bring it over the edges of the bed and begin tacking, following the tacking sequence in Fig. 21. It's important that this be followed in detail and that the tension on the felt be just sufficient to remove all wrinkles. Tension should be kept uniform in two directions. When the tacking sequence in Fig. 21 has been completed, work the ball openings as in Fig. 24, making the initial end-pocket cuts as in Fig. 23.

Set the felted bed aside and install the ball-retarding flaps in the side and end pockets next, Fig. 22. The flaps which serve to cushion the straight drop of a ball, are supported with the free end in the pocket openings by means of holders which are three-piece assemblies made up of one piece of 1/4-in. plywood 4 1/4 in. wide and 4 3/4 in. long, a spacer of the same width but only 3 1/4 in. long and a wood block 3/4 x 2 7/8 x 4 3/4 in. The spacer is cut from the same material as the flap. These parts are assembled as indicated and glued in place in the tunnels with the slotted (the slot being formed by the placement of the parts) end flush with the edge of the ball pocket, one holder to each of the six openings. The flaps are cut to size, fingerholes cut through as indi-



cated, and then they are inserted into place in the open slot in each holder, Fig. 22. This manner of assembly permits easy replacement of the flaps after they weaken and possibly break from long usage. Note that the shape of part A, Fig. 19, also serves to tilt the flap as the ball drops.

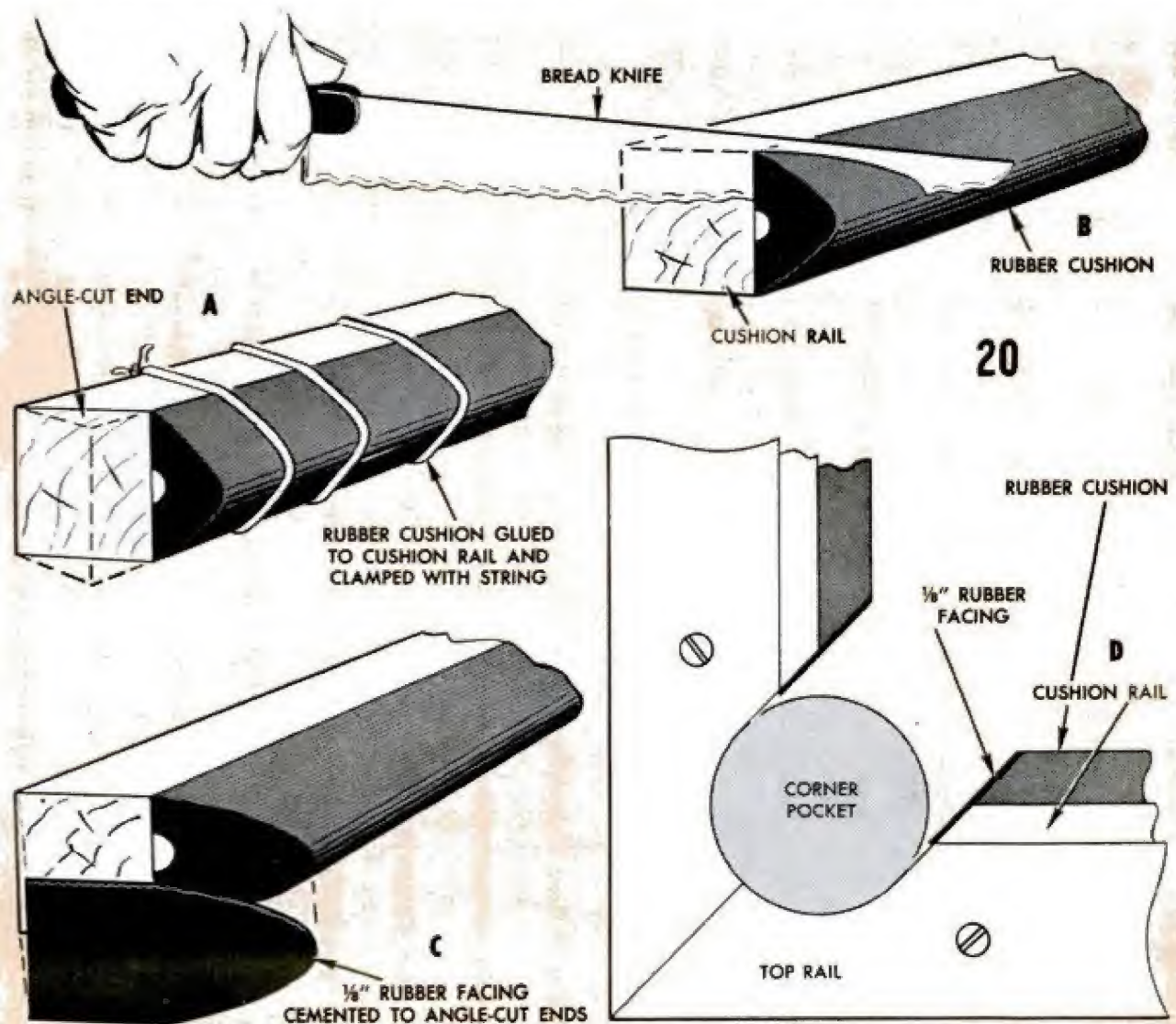
Now refer to Fig. 15 and also Part 1, Fig. 3. The sectional view, Fig. 3, shows a  $\frac{3}{4}$  x 1-in. clamping strip between the end rail (also the side rails) and the rabbeted riser, part B, which supports the inner rabbeted edge of the top rail. Note that this strip serves a threefold purpose—it clamps the bed firmly to the supporting shelf members, it provides a screw base for the countersunk screws anchoring the top rail and it serves as a nailing strip for the nails holding the riser, B. The whole assembly is easily removed, permitting the bed to be refelted when necessary. Still referring to Fig. 3, Part I, note the  $\frac{1}{16}$  x  $\frac{1}{4}$ -in. rabbet on the lower edge of part A. It is not shown elsewhere on details of part A. Its purpose is to permit shifting the cushion-mounting rail (part A) in order to hold the outer edge, or apex, of the cushion at a point exactly  $1\frac{3}{16}$  in. (for a  $2\frac{1}{4}$ -in. ball) above the



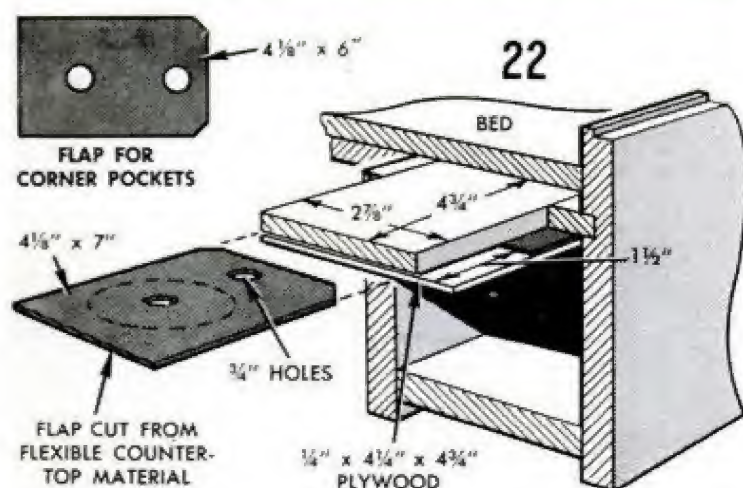
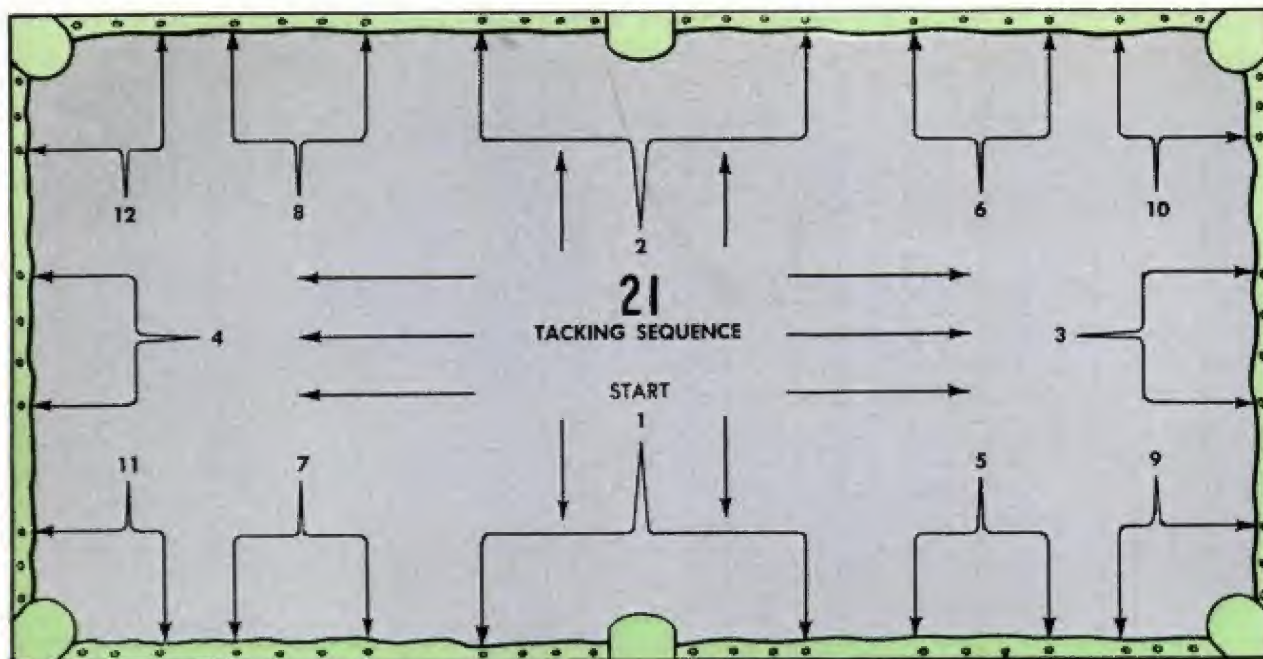
**CORNER AND SIDE-POCKET LINERS** are made from No. 2½ tin cans lined with a flexible countertop material

surface of the felted bed. This is important.

Referring now to Fig. 15, cut the clamping strips, the risers and the mounting rails and try them for fit with the bed in position. Once sure of the fit of the parts, glue the rubber cushions to the mounting rails with a special adhesive and wrap with cord at spaced intervals as in detail A, Fig. 20. Be



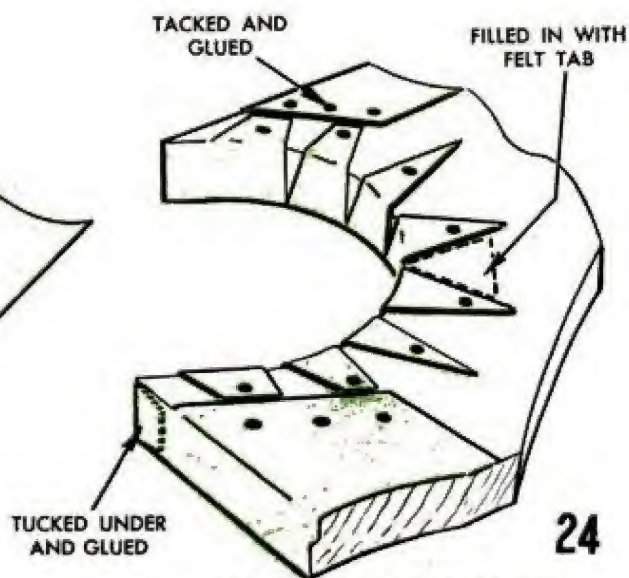
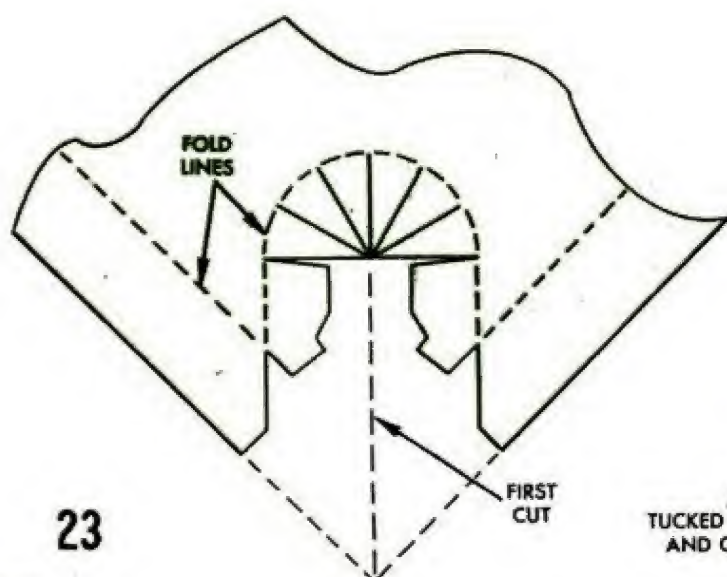




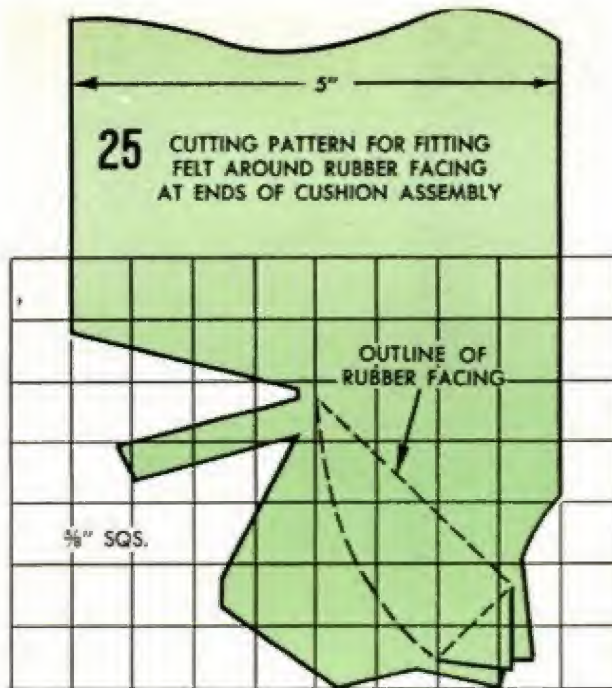
**RETARDING FLAPS** are placed in the side and corner pockets as detailed above. These flaps fit loosely into holders made as detailed and can be replaced when worn after long use. Below, bed felt is cut and fitted around edges of ball-pocket openings in particle-board bed. Patterns show how to make cuts

sure to allow sufficient cushion material at the ends of each member of the mounting rail for trimming as in detail B, Fig. 20. Use a sharp bread knife for trimming flush with the miter at the ends. Then apply the rubber facing as in detail C and trim to the contour at the mitered ends of the mounting rails. Note in detail D, Fig. 20, that the rubber facing extends its full thickness into the pocket.

Now comes the application of the felt covering to the cushions. Note in Fig. 26 that the felting goes all the way around both cushion and rail and is butted and tacked on the back face of the rail. Cut the strips of felt 5 in. wide. Fig. 25 gives the pattern for cutting the felt for a neat fit around the rubber facing at the ends of the cushion







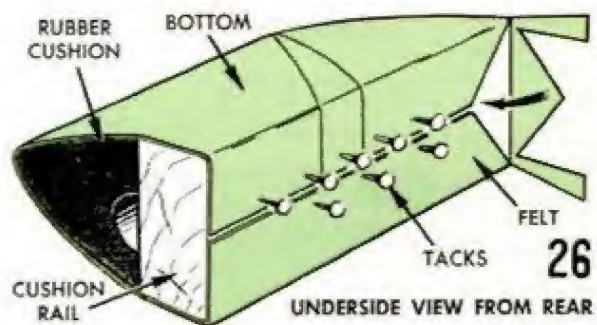
assembly. Work carefully on this job so that you get the felt in place without any wrinkles. Temporary rows of tacks are used to hold the felt while the glue dries. The tacks are later removed.

Refer again to Part I, Fig. 3, parts A and B. Note that in the assembly detailed the riser B is screwed to the cushion mounting rail A and the riser B is then nailed and glued to the clamping strip. Space the nails about 6 in. apart. It's a good idea to drill undersized pilot holes for the nails to prevent splitting of the clamping strip. Four screws are used to fasten each clamping strip to the bed. These are located  $3\frac{1}{2}$  in.

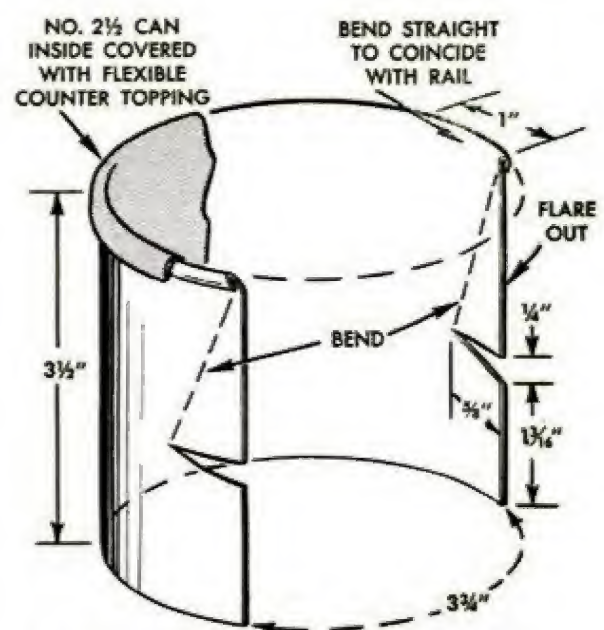
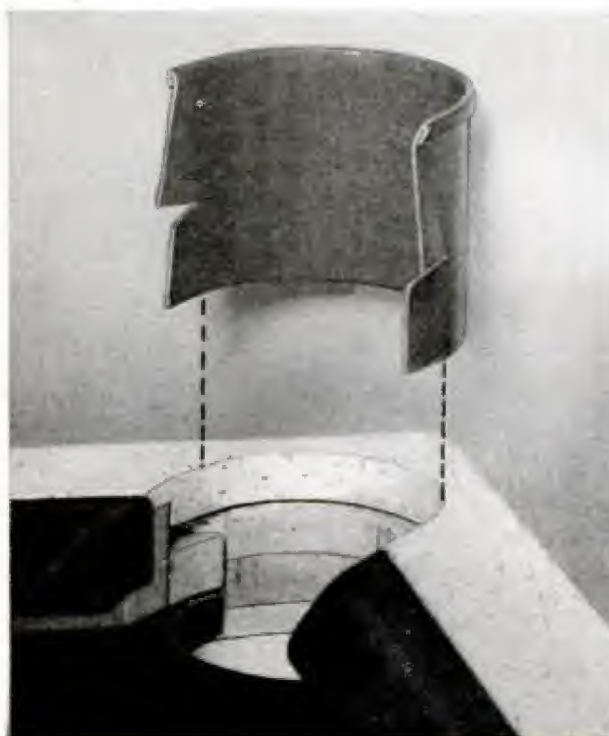
(Continued to page 215)



**BALL-POCKET LINERS** for side pockets differ slightly from those fitted into corner pockets as you will see from Fig. 27 and also from photo at the lower left



**RUBBER CUSHION** and rail are covered with felt as in detail. Note that rows of tacks are staggered.



**27** HOW METAL CORNER-POCKET LINERS ARE FORMED FROM TIN CANS



# SLING PSYCHROMETER

By Duane Loewen



IT'S THE high humidity that makes you feel uncomfortable on a summer day. But in winter low relative humidity can make you uncomfortably chilly in a warm room. Modern homes, gasketed and weather stripped, insulated and vapor sealed, are almost airtight. That's why it's becoming necessary to condition the air in the rooms winter and summer by dehumidifying in summer and humidifying in winter to hold relative humidity at comfortable levels during seasonal extremes. But before you can control humidity in the home you must have some method of measuring it accurately. That's why it will pay homeowners to make this simple wet-bulb hygrometer, or more properly, a sling psychrometer.

## HOW IT WORKS

Relative humidity is the percentage of saturation of the air measured from 0 to 100 percent, the latter figure representing the maximum amount of moisture that a given amount of air will hold at a given temperature. This is inversely proportional to the rate of evaporation from any moist object, and is the principle on which the psychrometer works. Evaporation of moisture on the bulb of one thermometer (two are used) lowers its reading relative to the other thermometer which gives the ambient (actual) room temperature. The readings are compared and then are converted to relative humidity, using the table on the opposite page.

## HOW IT'S MADE

Details on the opposite page show clearly how to construct the psychrometer. Two ordinary matched thermometers (they must read alike at any given temperature) are joined back to back and attached to a length of light wire chain. The free end of the chain is joined to a 6-in. length of hardwood dowel. To one of the thermometers you cement a plastic vial to hold a cotton-cloth wick which is inserted in the vial and carried up around the bulb of the thermometer glass. The wick should entirely enclose the bulb; hold it in place with a loop of thread tied loosely just above the bulb. Before using, be sure screws and bolts holding the two thermometers and chain are tight.

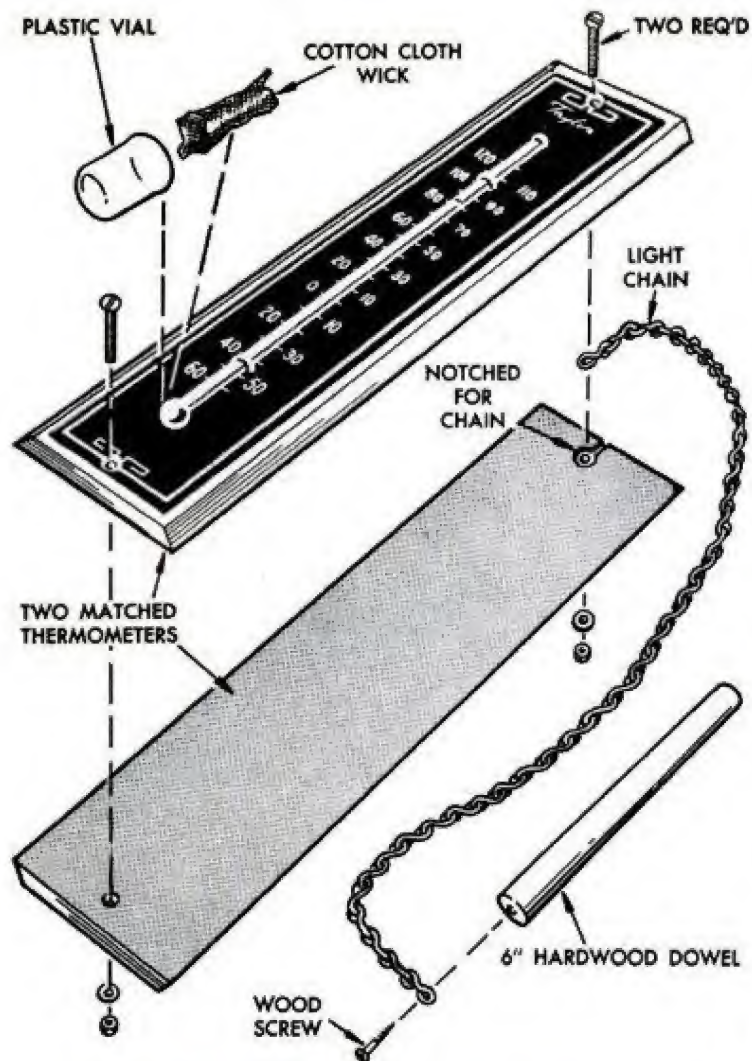
## USE OF INSTRUMENT

It will be noted that distilled water is called for in the materials list. This is not essential unless your water is very hard, that is, has a high mineral content. Then it is best to use distilled water. The small quantity required can be obtained by condensing steam from a teakettle. The first step in the use of the psychrometer is to place a few drops of the distilled water in the vial, enough so that the wick is saturated. Then, immediately whirl the thermometers slowly in a clear area in the room at a uniform rate, continuing until the wick is dry and the wet-bulb thermometer will not drop further in temperature. This usually takes two to three minutes. Then quickly take the readings of both thermometers and compare with the table which converts the readings to relative humidity. As an example, suppose the dry-bulb thermometer shows a temperature of 72 degrees, but the wet-bulb thermometer shows only 59 degrees. As you will see from the table the humidity would be 46 percent, which is a good average for health and wintertime comfort.

## MATERIALS

Two matched thermometers (see text)  
Light chain (approximately 12 in. long)  
Plastic vial  
Wick (made of open-weave cotton)  
Hardwood dowel ( $\frac{1}{2}$  x 6 in. for handle)  
Distilled water (see text)





## RELATIVE HUMIDITY TABLE

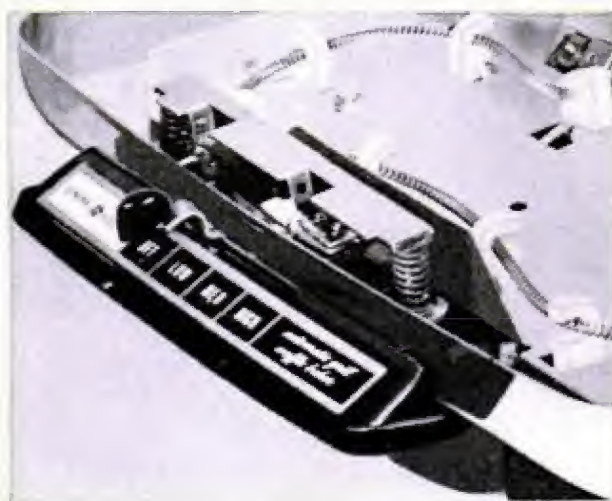
### Wet Thermometer (F)

	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53		
	80	61	57	54	51	47	44	41	38											
	79	63	60	57	54	50	47	44	41	37										
	78	67	64	60	57	53	50	46	43	40	37									
Dry Thermometer (F)	77	71	67	63	60	56	52	49	46	42	39	36								
	76	74	70	67	63	59	55	52	48	45	42	38	35							
	75	78	74	70	66	63	59	55	51	48	44	40	38	34						
	74	82	78	74	70	66	62	58	54	51	47	43	40	37	34					
	73	86	82	78	73	69	65	61	58	54	50	46	43	40	36	33				
	72	91	86	82	78	73	69	65	61	57	53	49	46	42	39	35	32			
	71	95	90	86	82	77	73	69	64	60	56	53	49	45	41	38	34	31		
	70		95	90	86	81	77	72	68	64	60	56	52	48	44	40	37	33	30	
	69			95	90	86	81	77	72	68	64	59	55	51	47	44	40	36	32	
	68				95	90	85	81	76	72	67	63	59	55	51	47	43	39	35	
	67					95	90	85	80	76	71	67	62	58	54	50	46	42	38	
	66						95	90	85	80	76	71	66	62	58	53	49	45	41	
	65							95	90	85	80	75	70	66	62	57	53	48	44	
	64								95	90	85	79	75	70	66	61	56	52	48	
	63									95	90	84	79	74	70	65	60	56	51	
	62											94	89	84	79	74	69	64	60	55
	61												94	89	84	79	74	68	64	59
	60													94	89	84	78	73	68	63





## WAFFLER



# Household

**L**IKE ALL other household appliances made by reputable manufacturers, electric wafflers, or waffle irons as they are still very often referred to, will take a lot of usage, many, many hours of it without ever a service break. But some morning your waffler may refuse to work. And then what? You go without your favorite breakfast until you fix the appliance.

First, you remove the waffle grids and once you locate the screws, again comes the caution, go easy on that screwdriver! Note the three photos of the insides of a typical automatic waffler at the left. Although your waffler may not look just like this one when it's opened, in the essential parts they all are pretty much alike. First of all examine the cord and don't just look casually at the ends of it; go over every inch of the cord to catch any breaks or frayed portions, either at the plug, the terminals or any point in between. If the cord shows defects, and it may if it's an older one, it should be replaced. Don't attempt to repair it by taping the breaks.

Other especially vulnerable parts of a waffler are the ceramic insulators which support the heating elements. These are shown in the inset and pointed out by the arrow in the upper photo at the top of the page. Take a good look at each of these supports and if any are cracked, replace them. These insulators in most wafflers are the sole support of the elements and if one or two let go, the element may sag and touch the metal of the housing. Should this hap-



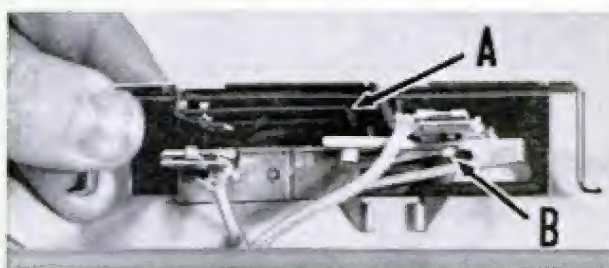
# Appliance Fix-It File

pen one could get a nasty shock when using the waffle.

Then there are the contact points, and the thermostat (see arrows A and B in the photo at the right) which usually is of the bimetal type. The sliding temperature selector at the front of the appliance (on some waffle makers this is the rotating type) limits movement of the thermostat and therefore controls the length of time the elements are allowed to heat. As the points make contact and break often, they are subjected to carbon formation and pitting.

To keep the waffle in working order the points should be cleaned and brightened periodically. This usually can be done by stroking a length of cardboard between the points when they are closed. If they are pitted, then stroking the meeting surfaces with a strip of fine sandpaper should do the trick. Work carefully so that you do not spring the points out of line.

If your waffle operates too hot or too cold at a given temperature setting, this gen-



erally can be corrected by bending the thermostat arm closer to, or farther from, the points. Or, if the unit appears to be irreparably damaged, replace it.

Broken elements, lower photo above, should be replaced. Should it be necessary to replace only one element due to breakage, it is advisable to replace both. Then the elements will operate with equal efficiency.—John Pennington

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## How to Clip and Save

DESIGNED to be clipped and punched for insertion in a standard loose-leaf binder, each page of the beginning article of the series (October) should be pasted to a cardboard backing. Then as succeeding articles appear, the left-hand page is pasted to the back of the previously mounted right-hand page and so on, eventually making a durable reference file to check when trouble shooting any common electric household appliance





# FUN WITH "SQUOZEN" SPONGES

Watching these magic seeds and snake pills come to life holds a curious fascination for both young and old. What appears to be a tiny inanimate seed wiggling and squirming in water, growing larger and larger by the second and finally stretching out to many times its former size is simply a highly compressed piece of sponge.

The accompanying picture sequence tells the story. The important thing is that you use only a fine-grain cellulose sponge. Such sponges are readily available at most any local photo shop, and the larger the sponge the better. The compressed pills are "frozen" in compressed form by baking at low heat in the kitchen oven until they are as hard as stones. They can be used over and over by merely recompressing and reheating.—Thomas C. Thomas

*PO Box 236  
Sedona, Arizona*



*Two little pills . . .*



**SLICES OF SPONGE** should be about  $\frac{1}{4}$  in. thick and can be cut with a bread knife or fine-tooth saw. As for the silhouette shapes, below, the sky's the limit



**FOR EXTRA DRAMA** dye the sponge a vivid color with Rit dye before slicing after sponge is dry. Bind the compressed sponge with turns of thread, below







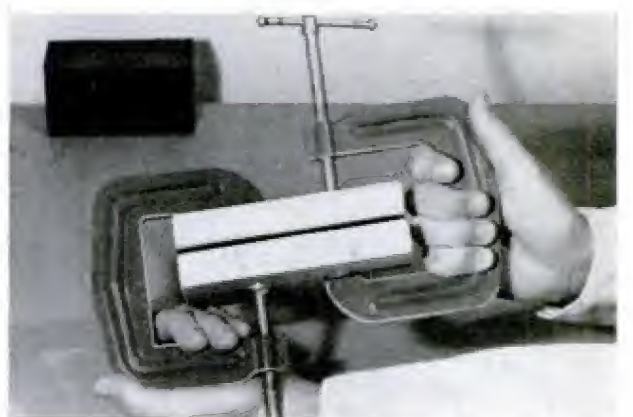
*dropped in water..*



*HOLY MACKEREL!*



**SNAKE PILLS** are easier to make than silhouette seeds. After block of moistened sponge is compressed and dried, pills are punched out with paper punch, below



**HERE'S HOW** moistened block of sponge is compressed by clamping between wood blocks until  $\frac{1}{4}$  in. thick. Below, snakes are resqueezed with clothespin for reuse





# Solving

## HOME PROBLEMS



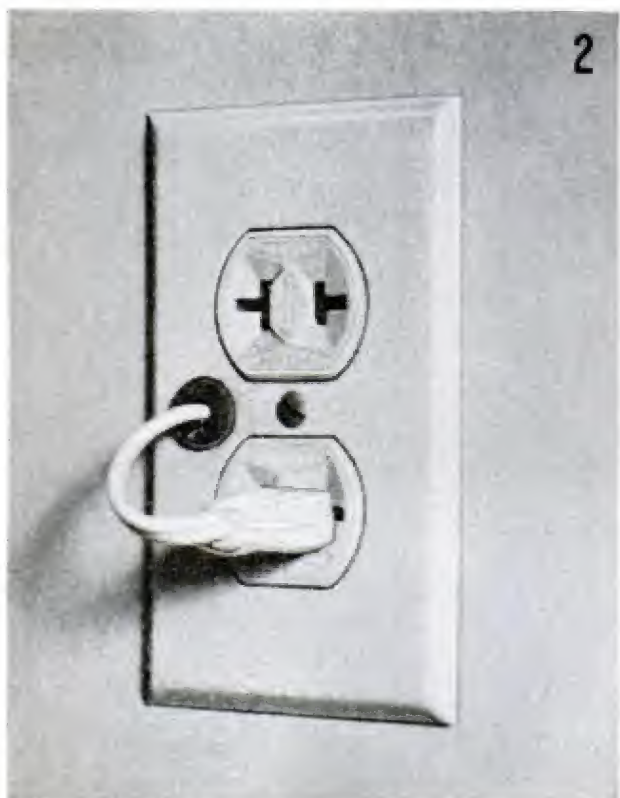
**1. NEXT TIME** friend wife asks you to hold a skein of knitting yarn while she rolls it in a ball, show her how a couple of spring-type clothespins and a waste-basket will do nicely in your sudden absence. All she need do is to clip the pins to the rim of the basket, spacing them to suit the length of the skein, and loop the latter around the upright pins

**2. TO CONCEAL THE CORD** from a wall-mounted clock, drill a  $\frac{3}{8}$ -in. hole about 2 in. below the support hanger and drop a length of furnace chain down inside the wall. Remove a knockout from the outlet box, catch the end of the chain with a paper-clip hook, then use it to lead the cord through a hole drilled in the cover plate and up inside the wall to the hole

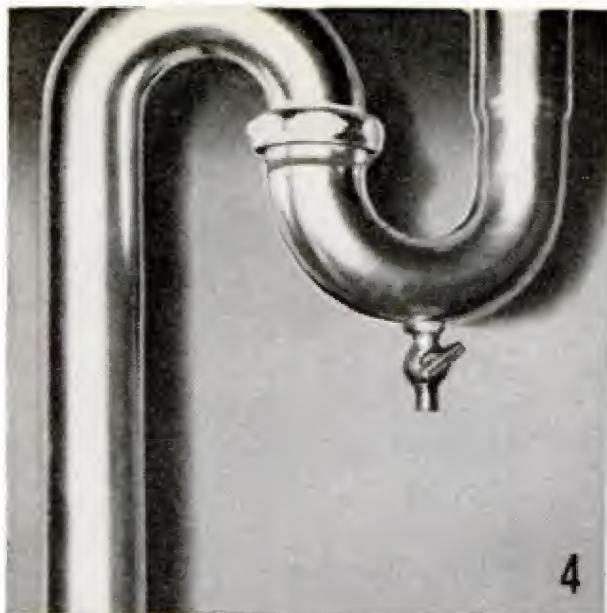
**3. PAINTING A PICTURE FRAME** always brings up the problem of finding a place to hold the frame while making those last few strokes with the brush. The next time you finish a frame, try tacking a thin strip such as a wood lath across the back. You'll find that the whole job will go faster, and when the frame is thoroughly dry the strip can be removed easily

**4. FROZEN SINK DRAINS** in vacation cabins and second homes can be prevented by soldering a pet cock to the trap. When closing the premises merely drain the trap, close the pet cock and the sink will be ready for use. If sewer gas is a problem, pour a pint of kerosene or antifreeze into the trap after draining. This can be flushed down the drain later

**5. TWO-O'CLOCK FEEDINGS** will be a lot easier if you fill a thermos with boiling water before retiring. Just a brief trip to the refrigerator to pick up the bottle and you can begin changing the baby while the bottle is warming in a container of hot water nearby. You can empty the container in the morning and return it to the nightstand for use the next night



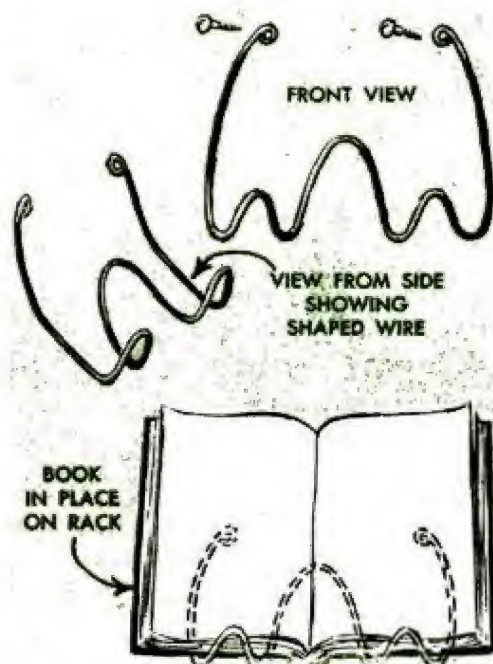
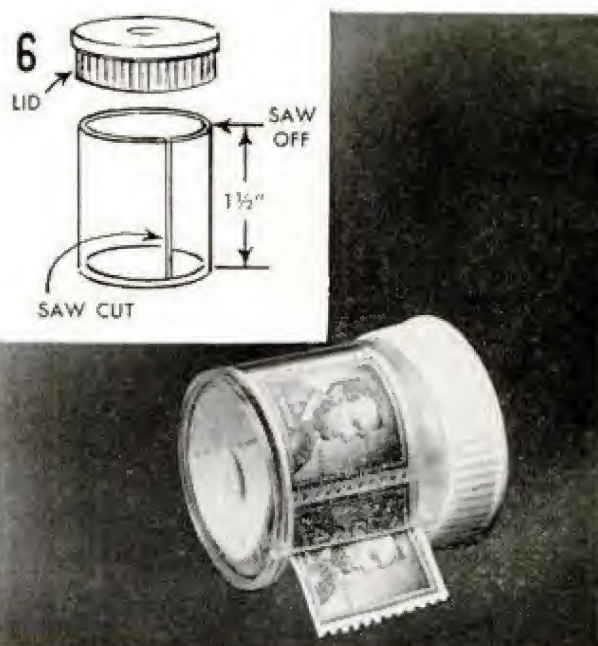




**6. POSTAGE-STAMP HOLDERS** can easily be made from discarded plastic pill containers. Choose a pill container about  $1\frac{3}{8}$  in. in diameter and saw it off to a height of about  $1\frac{1}{2}$  in. Using a thin-bladed fine-toothed hacksaw, cut a slot the length of the container. Smooth the rough edges with a knife

**7. ALARM CLOCK BROKEN?** You have a very accurate emergency alarm clock right in your kitchen if the stove has an automatic time outlet. Plug a table radio into this outlet, tune it to your favorite station and set the volume so that it can be heard in your bedroom. Finally, set the automatic timer

**8. KITCHEN BOOK RACK** which will hold a recipe book open to the right page is easy to make from a wire coat hanger. Straighten the hanger and cut it to a length of about 31 in. Bend a small loop in each end with pliers, and then shape it as illustrated. Mount the rack on a wall or inside a cupboard door



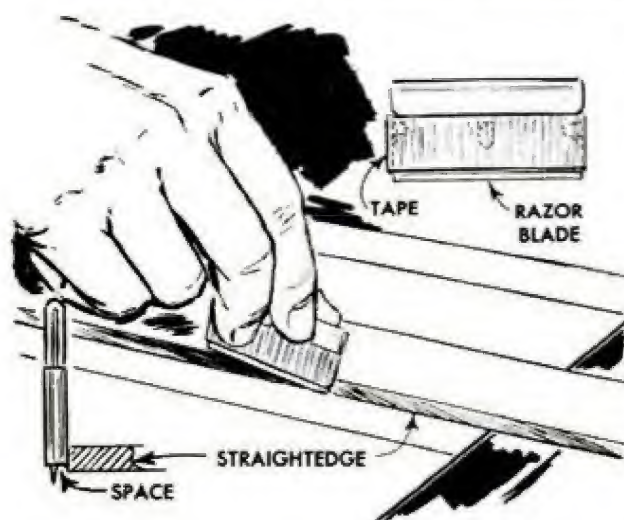




## Grid Ruling Square

Taking advantage of the uniform 1-in. spacing of holes in perforated hardboard, one craftsman found he could rule grid lines quickly with a "framing square" made of the material. Using  $\frac{1}{8}$ -in. hardboard having  $\frac{1}{8}$ -in. holes, he formed the inside (marking) edges along the arm and beam of the square by cutting the material on a line bisecting the perforations. To form the outside (ruling) edges he cut between the perforations so that both edges could be used to rule straight lines.

To rule off a 1-in. grid pattern, make a pencil mark at the center of each hole along the marking edge of the square. Do this across the top and bottom of the paper and up each side. Then using the ruling edge of the square, draw lines between the marks. Skip every other hole for a 2-in. grid pattern. To rule  $\frac{1}{2}$ -in. grids shift the square  $\frac{1}{2}$  in. after making the 1-in. markings.—*Ray Moore*



## Free-Wheeling Trimmer

When trimming photos, cutting oil cloth, etc., with a razor blade and straightedge the blade is likely to wander slightly and leave small nicks in the straightedge. To protect the straightedge, wrap the blade with several thicknesses of plastic tape leaving only a fraction of an inch of the cutting edge exposed. The tape will hold the blade away from the straightedge and prevent damage from occurring. As an additional precaution, hold the cutting edge as nearly perpendicular to the material as possible to overcome any tendency of the blade to turn toward the straightedge.

—*Fred Lettino*

## Parlor Putting

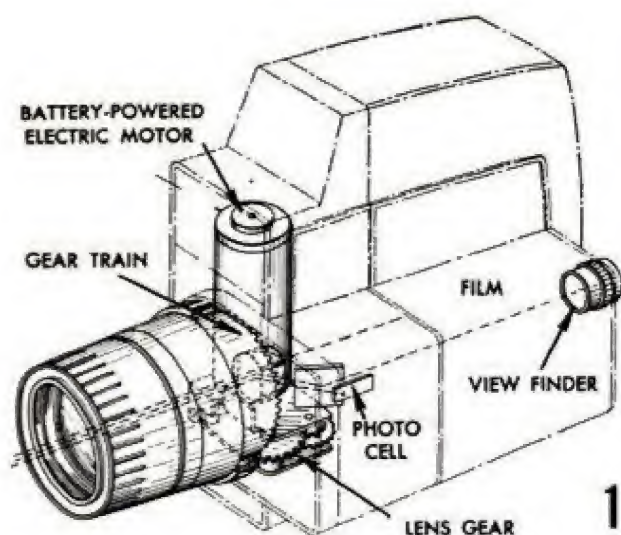
Every golfer knows that putting is half the game, and here's an idea that will let you turn the living-room rug into a practice putting green. Cut part of the side and bottom from a paper cup, as shown at left. Lay this on the carpet and try putting into the open end of the cup. It's light enough so that it will slide over the rug if you use much muscle.—*Walter Bamert*



One effective way to clean greasy hands after completing a messy repair job is to use granulated sugar as a substitute for hand cleaner. Simply wet the hands and rub about a tablespoonful of sugar between them, rubbing the sugar grains well into the grease. The grease and grime will be removed by rinsing, and the hands left clean enough to finish the job with ordinary soap.



# NEW FOR SHUTTERBUGS



**1. REFLEX 8-MM. ZOOM CAMERA** with through-the-lens electric eye "sees" actual area the film records and is not influenced by light or dark objects outside field of view. Camera provides through-the-lens viewing and focusing, plus an electric-powered, two-speed zoom lens. Price: \$349.95. Manufactured by Bell & Howell, 7100 McCormick Rd., Chicago 45, Ill.

**2. UNIQUE HORIZONTAL 8-MM. sound projector** is easily converted to an animated viewer, a sound unit or a 2x2 slide projector. And the unit even may be used for cutting film. Sitting behind the projector, the operator has all controls arranged directly in front of him. Nizo projectors are distributed by Burleigh Brooks Inc., 420 Grand Avenue, Englewood, N. J.

**3. POCKET-SIZE POLAROID electric-eye camera** does not require focusing or exposure adjustments. Operator simply aims, shoots and lifts out a finished picture 10 seconds later. Built-in flash gun is size of a man's thumb; uses AG-1 bulbs. In closed position camera measures  $7\frac{1}{2} \times 4\frac{1}{2} \times 3$  in. Price is \$74.95. Made by Polaroid Corp., Cambridge 39, Mass.

**4. SELF-ILLUMINATING light box** is designed for sorting and viewing 35-mm. color slides. Constructed of translucent plastic, box has five inclined shelves on which to work. It may also be used as permanent display for color transparencies. For easy storage, sorter folds into compact unit. \$4.95. Hudson Photographic Industries Inc., Irvington-on-Hudson, N. Y.







**1. DRYER** handles twenty-four 4 x 5 cut-film negatives or several film strips on upper, lower hangers

**B**UY A 32-gallon galvanized garbage can and you have the main part of this efficient controlled-heat film dryer. It will accommodate up to twenty-four 4 x 5 cut films or several lengths of roll film, and the novel heating element, plus the filtered air flow, together provide a constant circulation of warm air which promotes safe, rapid drying.

Assembled, the whole affair consists of the can, 60 ft. of 300-watt heat tape, a small motorized blower with flexible hose, an electric-iron thermostat, four pieces of T-shaped aluminum extrusion for legs plus the necessary cord, plug and pilot-light

**3. FIBERGLAS FILTER** is placed over holes drilled in garbage-can cover to trap dust entering the dryer



## TEN-MINUTE FILM DRYER



By Manly Banister

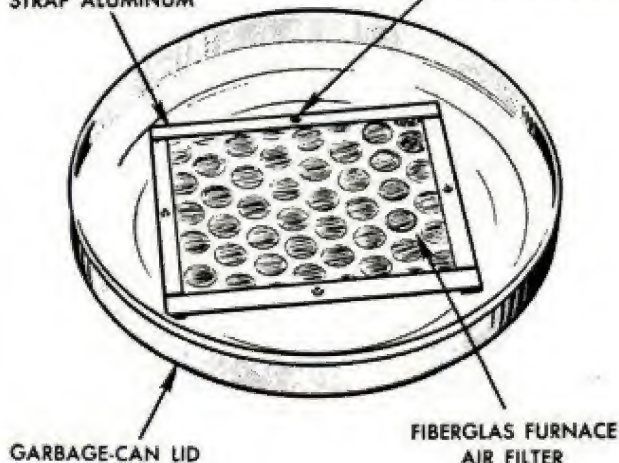


**2. LEGS** can be made by notching and bending aluminum T-shapes. Note how suction hose slips over outlet

switch. Those are the only parts you'll need.

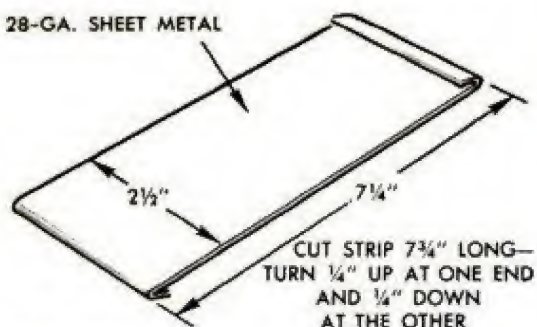
The first step is to clean the inside of the can thoroughly with a solvent such as lacquer reducer or carbon tet to remove all traces of the residues remaining from the galvanizing process. Then sweat spots of acid-core solder in vertically spaced rows to the inside of the can as in the right-hand view, Fig. 11. There should be about six rows of spots equally spaced around the inside of the can, the spots being spaced 2 in. on centers and the first one being located about 2 1/4 in. below the rim of the can. The first spot in the second row is located about 3/8 in. lower to give a spiral

**4. FILTER** is held in place by means of four aluminum straps. Filter should be cleaned occasionally  
1/8" x 3/4" STRAP ALUMINUM 6-32 x 1/2" MACH. BOLT

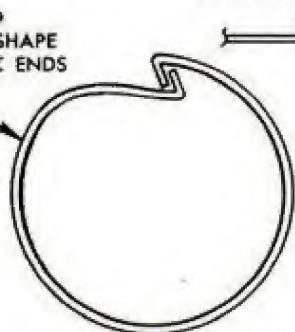




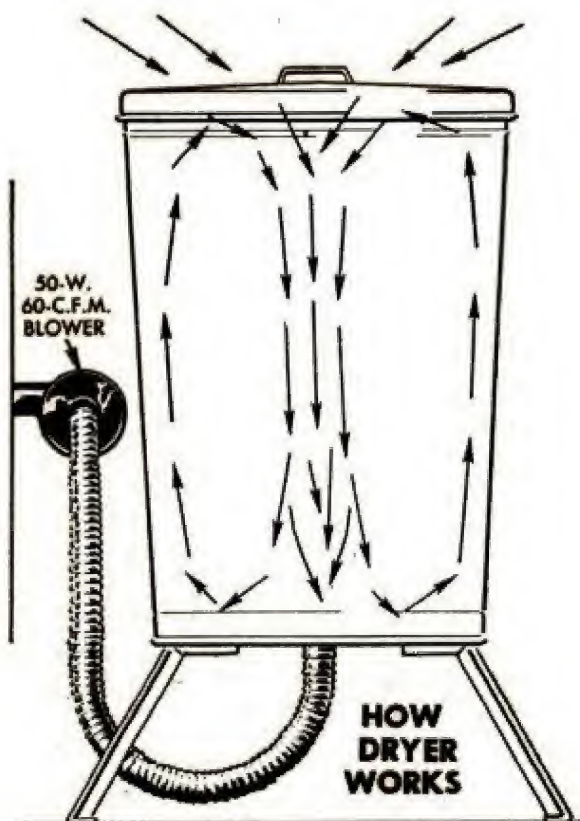
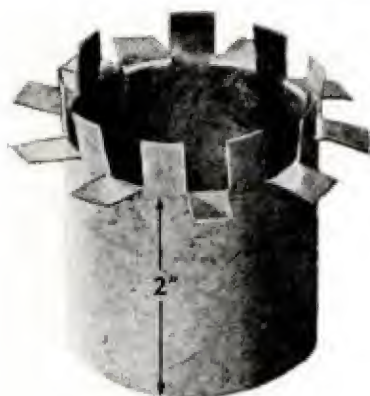
28-GA. SHEET METAL



BEND INTO  
CYLINDER SHAPE  
AND HOOK ENDS  
TOGETHER



HAMMER SEAM FLAT ON  
PIPE HELD IN VISE



5. AIR OUTLET, above, left, is soldered into hole in bottom of can. Above, right, the finished film dryer

progression from top to bottom of the can. These solder spots serve to anchor clips made from  $1\frac{1}{4}$ -in. lengths of 16-ga. wire. Bend a slight offset, about  $\frac{1}{8}$  in., near one end of each length of wire, hold the end nearest the offset on a solder spot and sweat in place. These clips support the heat tape which is placed inside the can in a continuous spiral, Figs. 11 and 12.

Next, make the air outlet connector as shown in the detail, Fig. 5, and cut  $\frac{3}{8}$ -in.-wide tabs all around one end, bending every other one outward. Cut a  $2\frac{1}{8}$ -in. hole in the bottom of the garbage can, insert the tabbed end of the connector and bend the straight tabs over inside the can to form a flange.



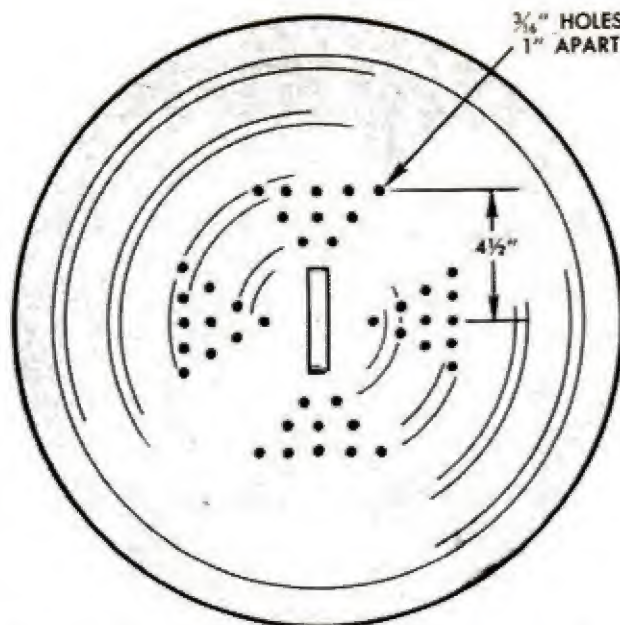


**6. HOLES** in a V-shaped pattern are drilled through can cover. Deburr with reamer to prevent hand injury



**8. AIR OUTLET**, Fig. 5, is soldered into hole cut in bottom of can. Outlet is covered with 1/16-in. felt

**9. FILM RACKS** are made by stringing picture wire arranged in a square with diagonals as pictured here

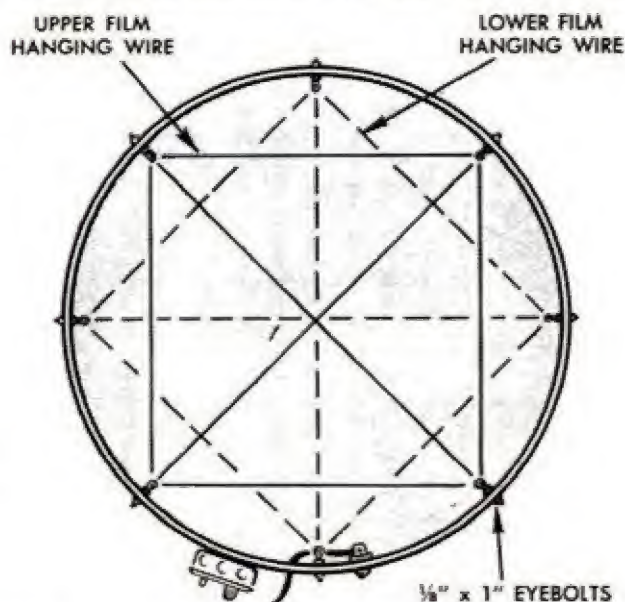


**7. DRILL TEN HOLES** in each group, keeping the holes 1 in. apart, spacing groups 90 deg. as shown

Then solder them to the bottom of the can, Fig. 8. Cement 1/16-in. felt around the outside of the outlet for a nice force-fit of the air hose, Fig. 2. Drill holes in the can cover as in Figs. 6 and 7 and to trap dust, install a filter on the underside of the can cover as in Figs. 3 and 4. The filter is made by stripping off the cardboard frame from a standard 12 x 16-in. furnace filter and cutting it square. Strips of 1/8 x 3/4-in. flat aluminum are used at the edges to hold it in place, the ends being lapped.

Legs can be made of anything handy. T-shaped aluminum extrusion was used for legs on the original although they can be made from 1/8 x 1-in. aluminum angle just as well, Figs. 2 and 12. Fasten them to the can with 3/16 x 1/2-in. stove bolts with

**10. TWO PICTURE-WIRE RACKS** are placed in the can, the second rack about 12 in. below the upper one







**11. HEATING TAPE**, above, is plugged into wafer-type outlet. Right, solder spots being sweated onto can

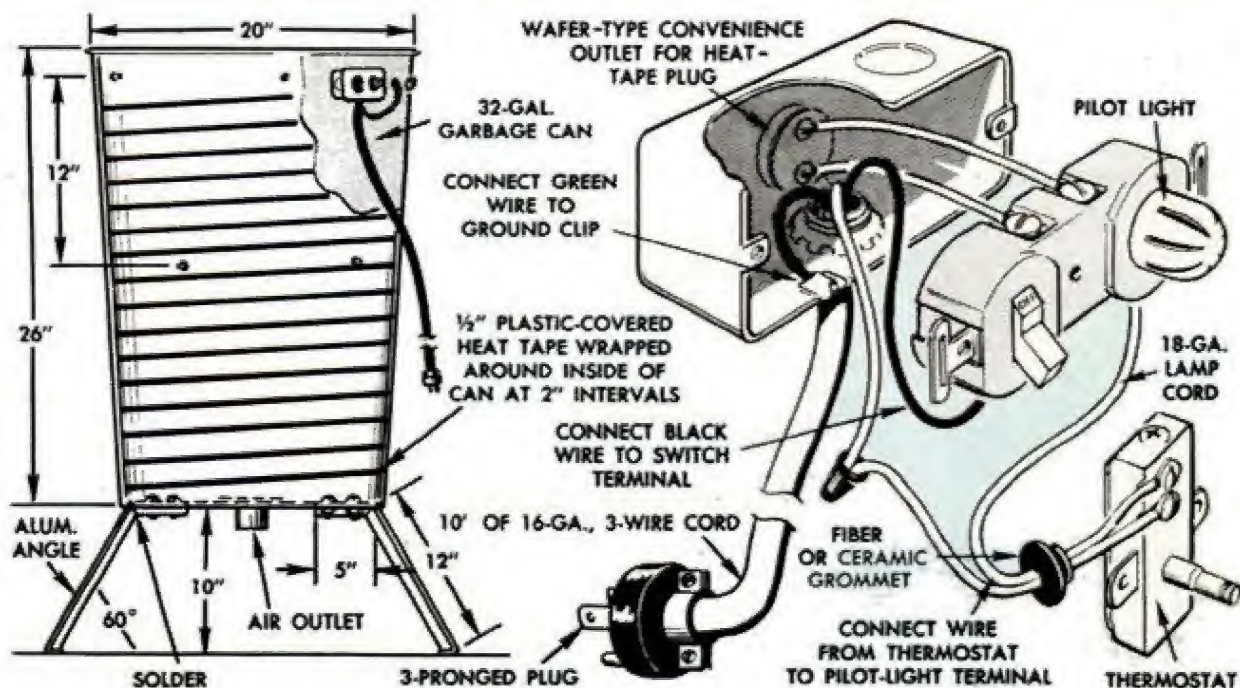
heads inside the can. Next locate the hole for the female plug, Fig. 11, by placing the surface box so that it clears the lid. The hole for the thermostat wires should be large enough to accommodate a protective grommet. Drill three holes a few inches from the grommet hole for mounting the thermostat, Fig. 11. Prepare the surface box by removing the center knockout and enlarge the hole to fit the wafer-type female plug, Fig. 12. Install the plug and mount the unit on the side of the can. The switch is a combination single-pole and 6-watt red pilot-light unit installed as



in photo, Fig. 5. The electric-iron thermostat should be grounded either through a 3-pronged plug or directly from the dryer to a water pipe. Plug the heat tape into the wafer-type plug inside the can and as you unreel insert it behind each clip in a uniformly descending spiral. If there is a foot or so left, it can be left loose on the bottom of the can. Finally, install the upper and lower film-hanger wire in Figs. 1, 9 and 10, using common picture-hanging wire.

Attach the flexible exhaust hose to the  
(Continued to page 210)

**12. EACH TURN** of the heat tape descends in a slow spiral to bottom of can as in left-hand detail. Legs can be aluminum angle, aluminum T-shape, anything suitable for the purpose. At right is wiring detail







## DIETER'S TRAVEL KIT

**NO MORE FUMBLING** in a crowded glove compartment for can opener and cups. All are handy in the kit



**T**RAVELERS ON reducing diets using the new liquid dietary supplements find that motoring presents a number of problems. Cans, can opener and cups are usually either packed away in a corner of the suitcase or left to rattle about in the glove compartment.

You'll find it easier to carry such liquid meals and a few helpful accessories on week-end drives and other short trips with this "lunch-box" travel kit. The compartmented box holds six small cans, several hot-drink cups, a can opener and an immersion heater. A tube of drinking straws and a package of paper napkins are carried in the spaces above the compartments.

The kit is assembled as detailed with both glue and brads at all joints. To make the rounded grip, cut a 5½-in. section of broom handle in half lengthwise and attach one half to each side of the center panel above the carrying slot. Be sure to stagger the lid hinges a bit so that the screws holding them to the center panel will not interfere with each other. Finish is a matter of personal choice, but try a color which will match or contrast with the car interior.

The drinking-straw carrier is made from





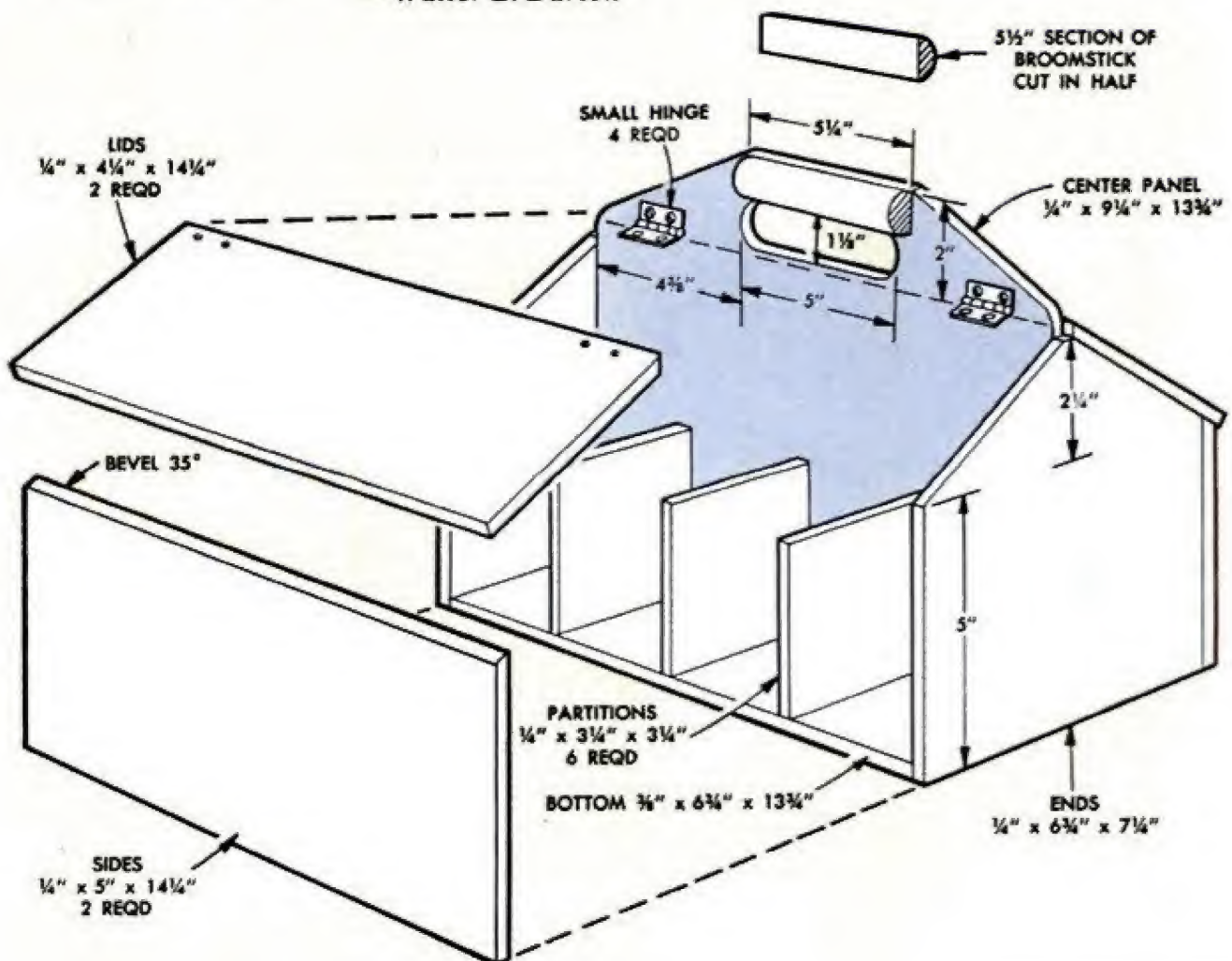
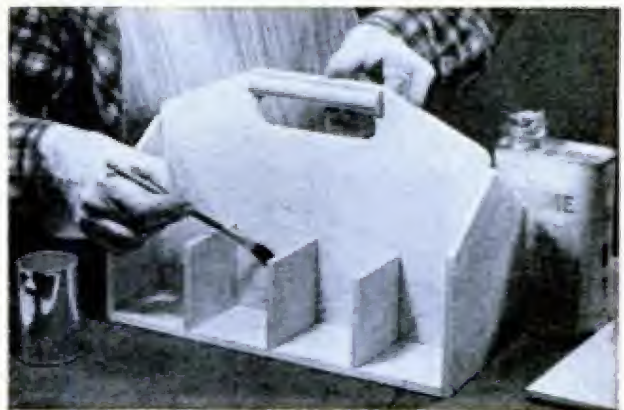
**ATTACH HANDLES** to the center panel, above, before assembling the kit. The inside of the box, below, should be finished before adding the sides and lids

a mailing tube. Glue a cardboard disk over one end and cover the other with a metal jar lid which fits tightly over the tube.

Since the different brands of liquid meals come in cans of different dimensions, you may have to position the partitions to suit.

While these liquid dietary supplements can be consumed at room temperature, many people prefer to heat them slightly. The heater illustrated here operates on standard house current, but you may substitute a heater of the type which plugs into your car's cigarette lighter, thus enabling you to prepare meals on the road.

—Walter E. Burton





# MR. DO-IT AND BUNGLE





**Bungle finally rings the bell this month after a lesson in doorbell repair, but Mrs. Bungle doesn't seem to show much confidence in her husband's mechanical abilities**



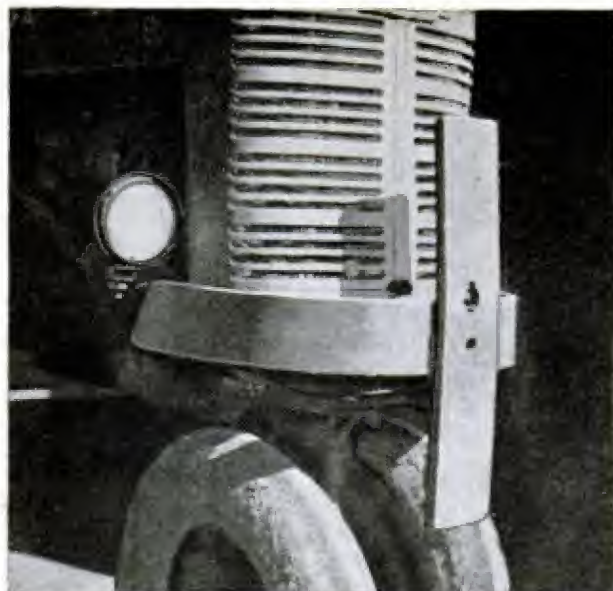


# FARM TIMESAVERS

## Big Push

Farmers with an eye to getting everything possible out of a tractor utilize both ends of it, the drawbar end for pulling heavy loads, the front end for a controlled push. The bumper you see pictured consists of a heavy curved member, the ends of which are bolted to the side frames of the tricycle tractor. The vertical member, or pusher, is a length of heavy steel channel. It projects just far enough to clear the front wheels so it can be used for easing a hoghouse or feeder into place or anywhere a controlled push is needed.

—A. M. Wettach



## Gate Crasher

Moving a heavy farm gate, panels of a feedlot fence built in sections, a feed bunk, or a sectional crib is no problem for farmers with tractor-mounted loaders. They simply free the gate, panel or bunk, ease the forks of the loading scoop through an opening between the boards, lift clear and away it goes. With the controls on present-day tractor loaders the load can be transported a few feet or across the farm and placed within an inch of where it's needed.



## Mailbox Merry-Go-Round

Eight farm families get their mail at this one-stop mailbox station. The eight boxes are each labeled with the owners name and are mounted Lazy-Susan fashion on a steel wheel salvaged from an old hay rake. A length of pipe set in concrete serves as the supporting post and a wheel bearing is formed by a flange welded about 6 in. below the top of the post. A pipe cap screwed onto the threaded end of the post prevents the wheel from being lifted off.

—Wayne Floyd



## Plant Hover

In the propagation of certain tropical plants in a greenhouse it is necessary to produce an artificial tropical atmosphere with conditions closely approaching those of the natural habitat. This can be done quite simply and inexpensively by arching short lengths of welded-wire fabric over the bench and covering with muslin in summer and plastic sheeting in winter. A perforated pipe runs the length of the bench under the canopy so that a controlled mist can be maintained, thus simulating natural growing conditions.





Coming up next . . .



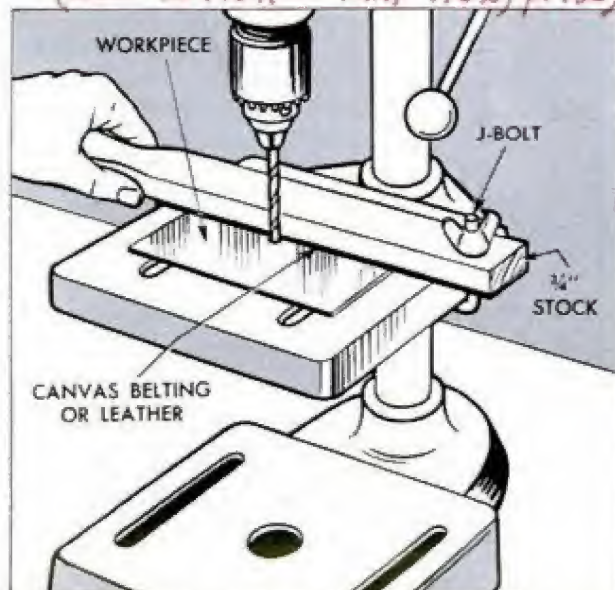
## Gauge Blocks

There'll be no mistakes when you use these gauge blocks on the steel square for laying out stair stringers and rafter cuts. The blocks are made from  $\frac{3}{4}$ -in. steel hex rod cut to a length of about  $\frac{3}{4}$  in., slotted, drilled and tapped for a stove bolt which serves as a setscrew.—J. Hamaguchi

## Quick Clamp

This quick-acting strap clamp holds pieces of sheet metal securely on the drill-press table. It consists of a length of hardwood faced with canvas belting or leather and a J-bolt which hooks under the lip of the table. After locating the work, adjustment of the wing nut allows it to be held with light hand pressure—Joseph Federico

(SEE LETTER—MAY 1962, p. 12)



**METAL FURNITURE.** See that desk in the picture above? Neat, isn't it? But it's more than that; it's practically unbreakable because it's made almost entirely of steel—square steel tubing and steel angles, welded. There's also a matching chair and ottoman. Details on all three in next month's PM.

**FORT SNOW.** Defenders of this fort are sure to hold against the heaviest snowball barrage attackers can throw at 'em. It's made of cast—that's right—cast snow blocks laid up masonry-fashion. There's a high tower for special defense strategy. February PM tells all about how to build it.

**ICE FISHERMAN'S SHACK.** Taken apart it's a light car-top bundle. Consists of wood-framed panels of insulating sheathing that bolt together in minutes. No central heating system, of course, but the shack breaks that cold wind and the black coating absorbs heat from the sun. Details in next month's PM.

**ROUTER JIG.** Takes any standard portable router, works from the edge of the material, makes cuts anywhere on panels up to 48 in. wide. All metal parts are made from readily available stock materials, which puts the building of the jig easily within the range of any small shop. See February PM.



# X549

## SEWING TO SAWING

*Only a few minor changes  
convert old sewing machine  
to efficient shop saber saw*



**N**EARLY ALL older type sewing-machine heads contain all the parts necessary for conversion to an efficient jigsaw, even to the drive pulley. Just supply a table, blade and power source and there you are. This conversion is an accessory for a wood lathe but can be assembled for belt drive from a small motor.

The first step is to remove the sewing head from the base. Discard all the mechanism except the main drive shaft. Then remove the cover plate at the end of the arm, remove the needle spindle and substitute the pressure-foot spindle, or rod, which is about 1 in. longer on most machines and is fitted with a holder which can be adapted to serve as a blade chuck. Note the details at the left on the opposite page, which are only representative but do suggest ways of adapting these parts to holding regular saber blades or small files. It is quite possible that some saber blades will require filing down to a narrower width to adapt them to the improvised chuck.

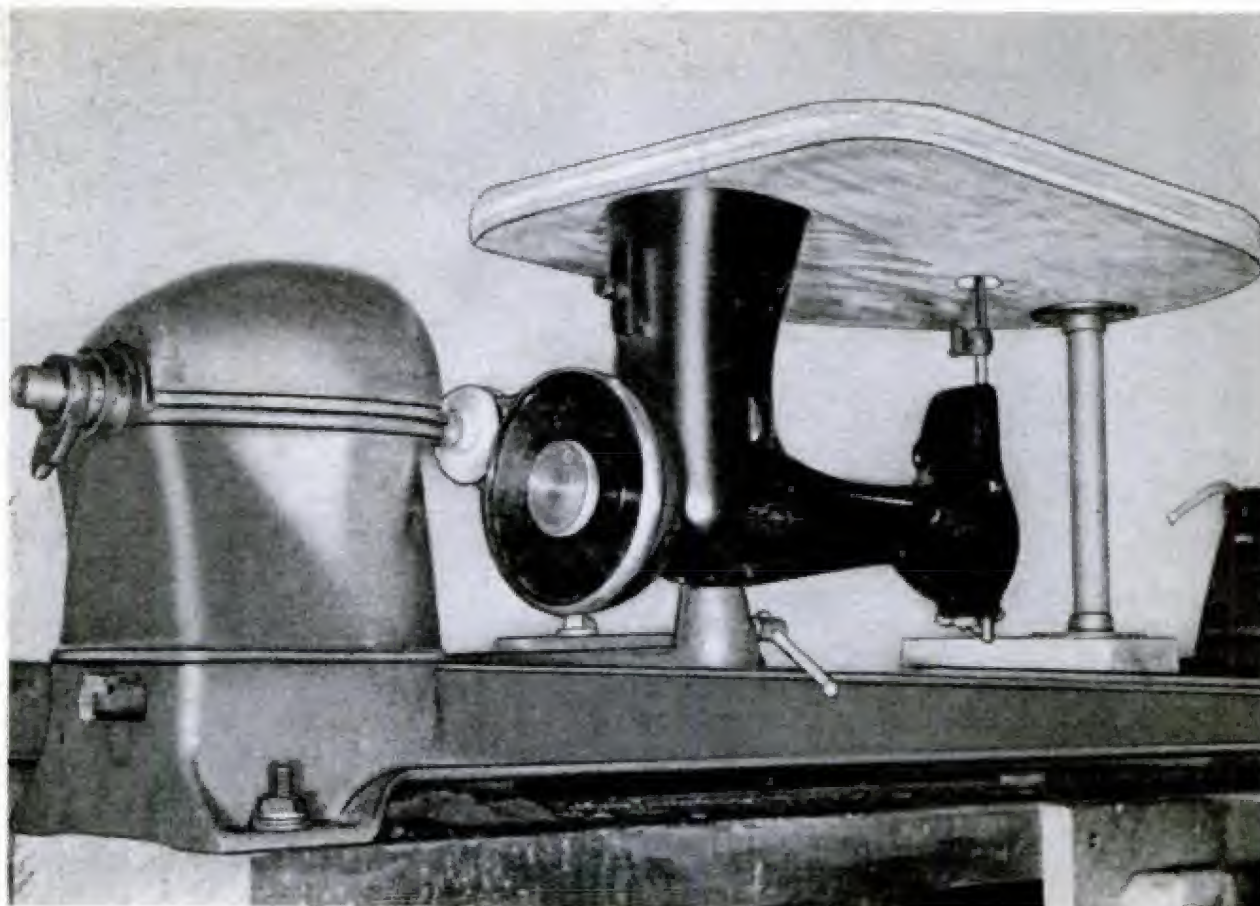
Usually the pitman and pitman disk have adjustments to compensate for wear and length of stroke. Check these adjustments

before putting the mechanism into service as a jigsaw. Although not shown and not used on the original adaptation, it might be well to cut and fit a metal disk about 2 in. in diameter just below the blade holder. This will act as a sawdust slinger, or guard.

To fit the sewing head to a wood lathe as pictured cut a plywood table and mount the sewing head upside down as detailed at the right on the opposite page. The sewing head is supported by the plywood table and also by a stud, A, which is held in the tool-rest holder. The end of the stud fits snugly into the hole which normally takes the spool holder. The outer end of the table, to which the sewing head is attached, is supported on an assembly consisting of a length of  $\frac{3}{8}$  or  $\frac{1}{2}$ -in. pipe, two flanges and a clamp made of two pieces of hardwood and held on the lathe bed by the bolt, B.

To drive from the lathe spindle, weld a 2-in. V-pulley to a No. 2 Morse taper chuck adapter and use the same  $\frac{1}{4}$ -in. V-belt as was used originally to drive the sewing head. Use the four speeds of the lathe headstock to vary speed of the jigsaw, low speeds for filing.—*Henri A. Fluchere*

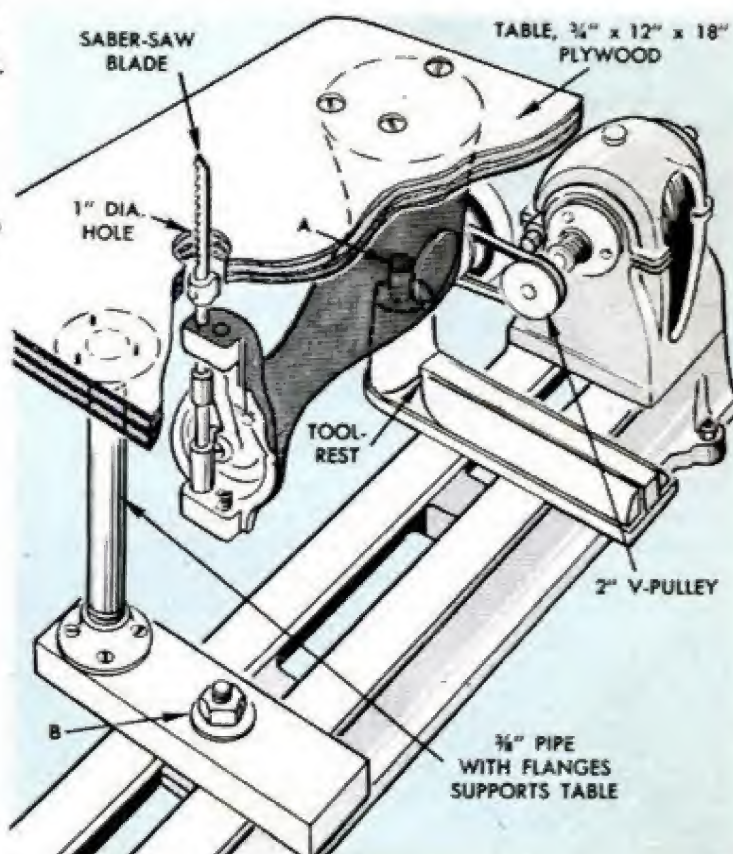
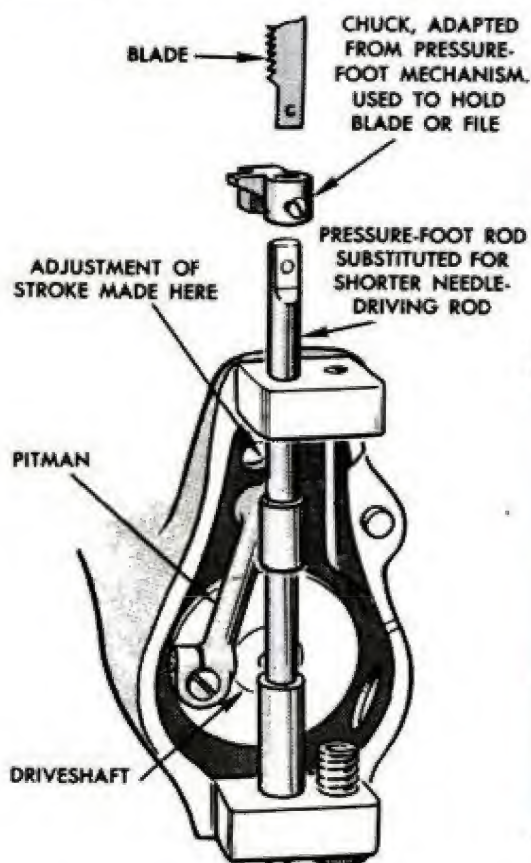




IT RUNS "just like a sewing machine" except that only a part of the original sewing head is used. Table can be somewhat larger than dimensioned but make sure that it's solidly supported by lathe-bed clamp

NEARLY ALL old machines have a pitman assembly that can be adapted to jigsawing

SEWING HEAD can be mounted on a lathe as an accessory or can be adapted to belt drive from a small motor of 1750 r.p.m.





## SHOP SHORT CUTS

### Spin a Countersink

Countersinking thin sheet metal is not always possible or practical with a regular countersink. You'll do this job a lot faster and with a greater degree of uniformity if you first drill the holes for the screws a trifle undersize. Then chuck a short length of hardwood dowel in the drill press, point the end with a file and use this as the countersink. Use medium spindle speeds, apply paraffin or beeswax to the pointed end of the dowel.—*R. J. DeCristoforo*

### Hold a Soldering Iron

You've probably already wondered, isn't there some further use for those neat dispensers you get with a roll of cellulose tape? There is. Save the next one you get and use it as a soldering-iron holder. It keeps the hot iron clear of the bench top; no danger of setting things afire or burning your hand and the iron is always within easy reach when you're doing a job requiring intermittent use of the iron.

—*Wayne Floyd*

### Roll on Edge Tape

Here's a helpful gadget for that patience-trying, time-consuming job of applying wood tape to plywood edges. The handle keeps one edge of the tape aligned with the corner of the plywood edge and a roller attached to the handle, which is shaped something like a miniature boomerang, rolls the tape into contact. Bandsaw the handle from a piece of 1-in. stock and drill a tap-size hole through it for a  $\frac{3}{16}$ -in. stove bolt. Turn the bolt into the hole, then cut a 2-in. length from 1-in. dowel, center-drill it, slide over the bolt and turn on the nut.

### Center-Drill a Ball

If you've ever tried to center-drill a wooden ball, especially one of small diameter, or a wooden bead, you'll appreciate this special V-block. It's made by running perpendicular V-cuts in one face of a square block of hardwood, the V-cuts intersecting at the center of the block as pictured. The width across the top of the V-cuts must be the same. Also the width must be slightly less than the diameter of the ball to be center-drilled. After cutting the Vees, drill a hole at the center of the intersection, the hole being of the same diameter as that to be drilled in the ball. This gives you an accurate means of centering the V-block by simply running down the spindle until the drill enters the hole.





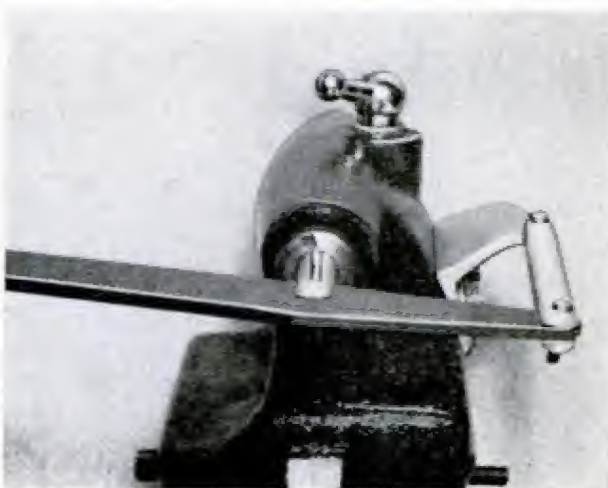
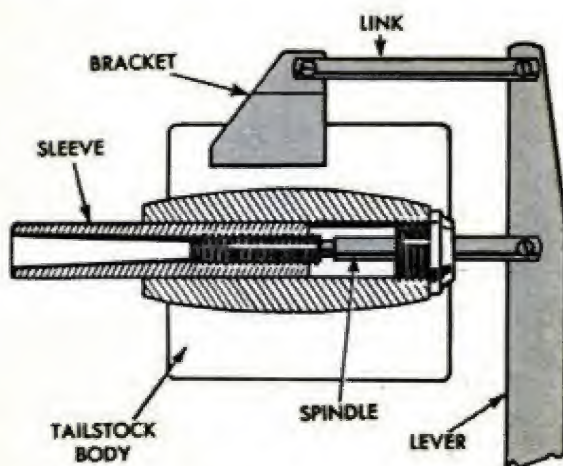
# Tailstock Hand-Lever For Small Lathes



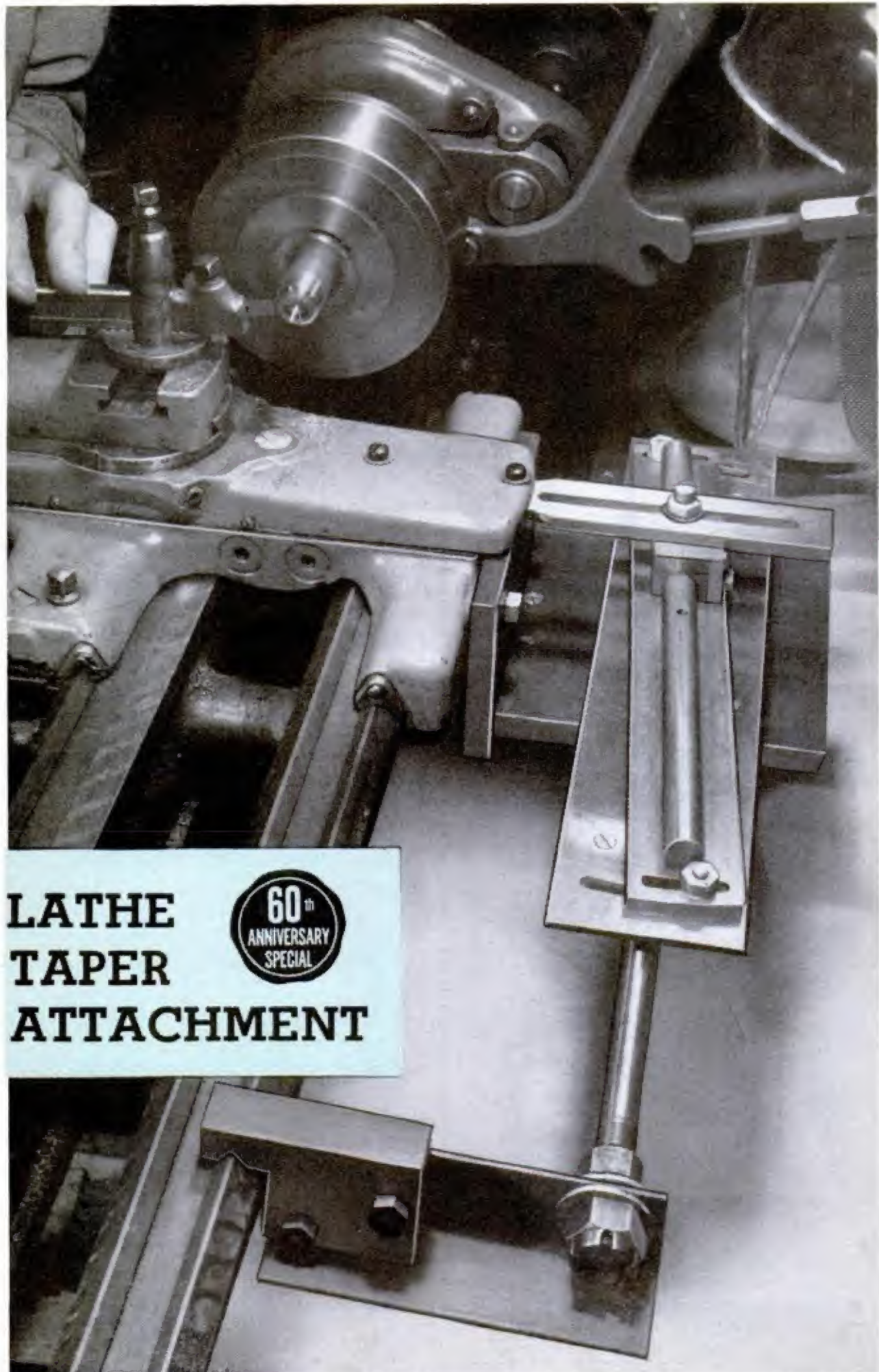
**LEVER-OPERATION** of the tailstock sleeve doubles or even trebles the work capacity of a small lathe when carrying out repeat operations such as drilling, tapping and reaming on semifinished workpieces. This is due mainly to the single stroke of the lever action when compared with the many turns of the conventional handwheel necessary to run the sleeve back and forth within the limits of its travel. The lever action conversion does not interfere with use of the sleeve in a fixed position.

No dimensions are given as you have to determine these from your own lathe. The first step is to measure the maximum travel of the sleeve. Remove the handwheel and the feedscrew, or spindle, and push the sleeve into the tailstock bore as far as it will go and mark its position. Then pull it out slowly, the locking lever being tightened just enough to provide slight resistance to movement of the sleeve. Note the point where the end of the sleeve slips past the locking-lever cam. Slide the sleeve back slightly, just enough so that when the locking lever is tightened the sleeve will be held firmly. Then measure the distance between this and the first, or in, position. This will give you the maximum travel. Use this same measurement to determine the center-to-center distance of the holes in the link and also the two holes in the handle, one hole taking one end of the link and the other the substitute spindle. To find the length of the spindle, push the sleeve all the way back into the tailstock. Measure the distance from its inner end to the outer end of the tailstock bore. To this dimension add the sleeve travel plus 1 in.

—Robert G. Vaughn



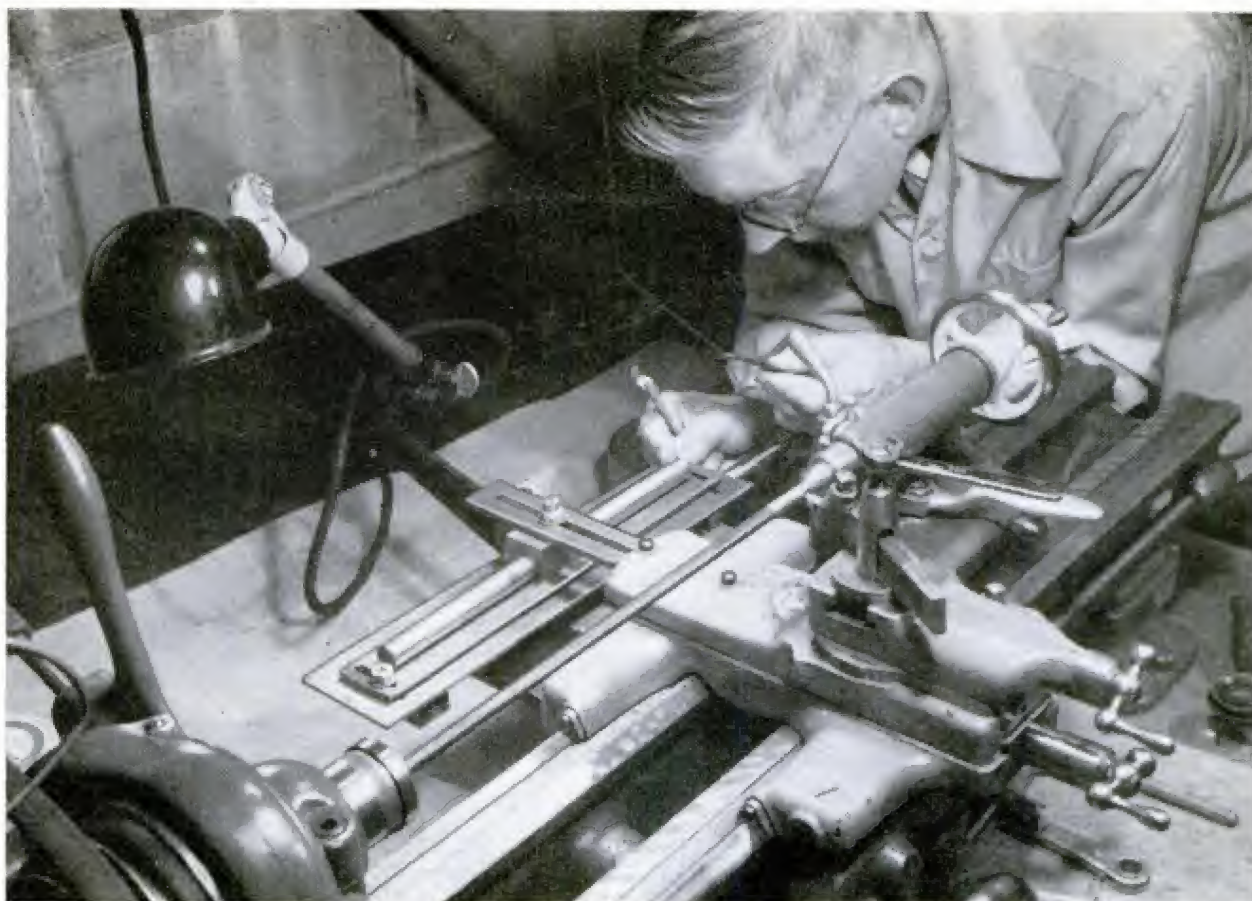




**LATHE  
TAPER  
ATTACHMENT**





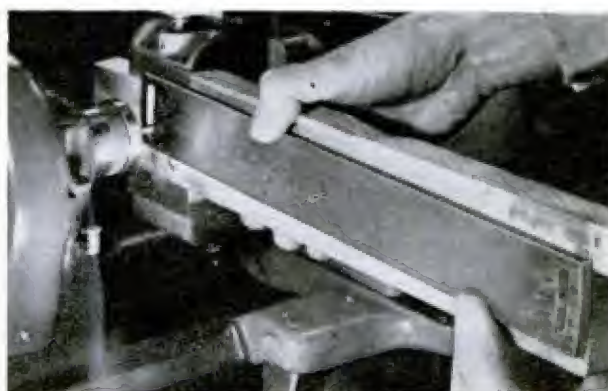


**1. SHOP-MADE TAPER ATTACHMENT** mounted on small lathe can be adjusted to turn outside or inside tapers on work mounted between centers or in a chuck for taper boring. Attachment is made entirely from stock materials

**By Walter E. Burton**

**T**URNING A TAPER by offsetting the tailstock of the lathe is a common practice but the method has several disadvantages. In turning a taper by offsetting, the lathe centers are out of alignment which can result in inaccuracies due to burring of the center holes in the work, also possible scoring of the lathe tail center. Only work mounted between centers can be tapered by the offset method; taper boring cannot be done. In small shops where the amount of taper work does not warrant the outlay for a conventional taper attachment it is possible, using stock materials, to make one to fit nearly all small lathes.

The taper attachment pictured in Fig. 1 and on the opposite page was made to fit a 9-in. lathe. As a rule the parts dimensioned in Fig. 6 through 8 will be suitable for various makes of 9-in. lathes and possibly those of slightly larger or smaller swing. Note that two of the parts are not fully dimensioned, the cross-slide connector and the bracket, Figs. 7 and 8. You can use  $\frac{1}{8}$  or  $\frac{1}{4}$ -in. stock for the connector, depending on the clearance. The 5-in. dimension on the bracket was found adequate for the lathe pictured, but may not be for all lathes in this size range. The bracket can be made



**2. SLOTTED ENDS** of swiveling bar, or carrier, are finished in lathe with milling cutter or rotary file

**3. SLIDE BLOCKS** are first bored offcenter, then reamed. If desired, blocks can be made from brass



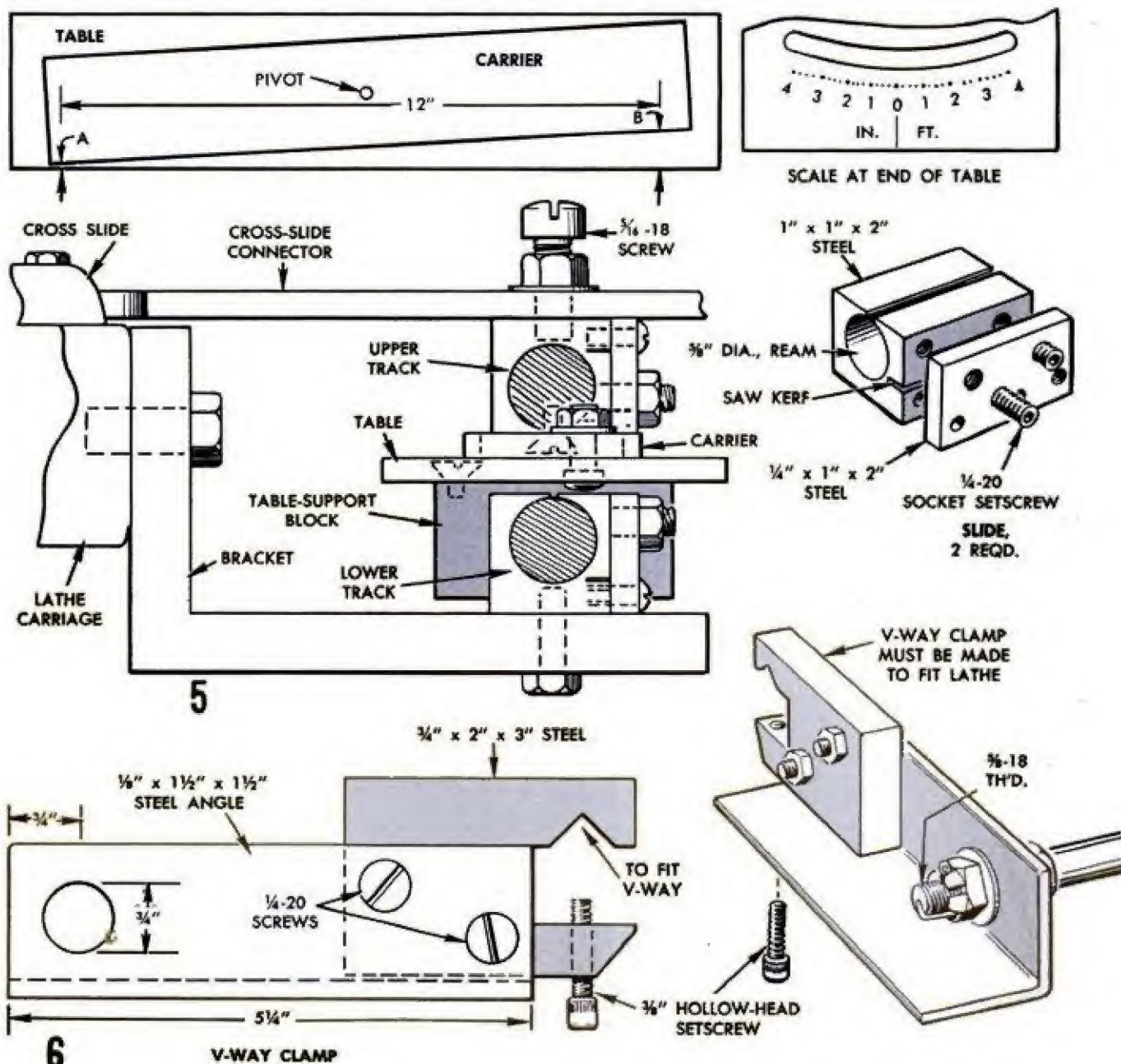




**4. SLIDE BLOCKS** should be lapped after reaming to assure smooth operation. Drill-rod track is coated with lapping compound. Block is stroked by hand

from a short length of heavy steel angle or can be made by welding two pieces of  $\frac{1}{2}$ -in. flat steel at a 90-degree angle. The bracket is screwed to the flat on the back face of the lathe carriage, Fig. 5. The dimensions on the angle bracket carrying the V-way clamp, Fig. 6, also should be checked with your lathe before cutting stock. The lower track, Figs. 5 and 8, should be parallel with the lathe ways.

The slides, Fig. 5, are bored off-center and reamed as in Fig. 3. After reaming, saw cuts (or milling cuts) are run through into the bore and into one side as indicated. Then when the capping piece is screwed in place, the setscrews, with locknuts, provide for clamping the slides at any point along the tracks. Then each slide is lapped to its track, using a lapping compound and a full-length stroke as in Fig. 4. After roughing

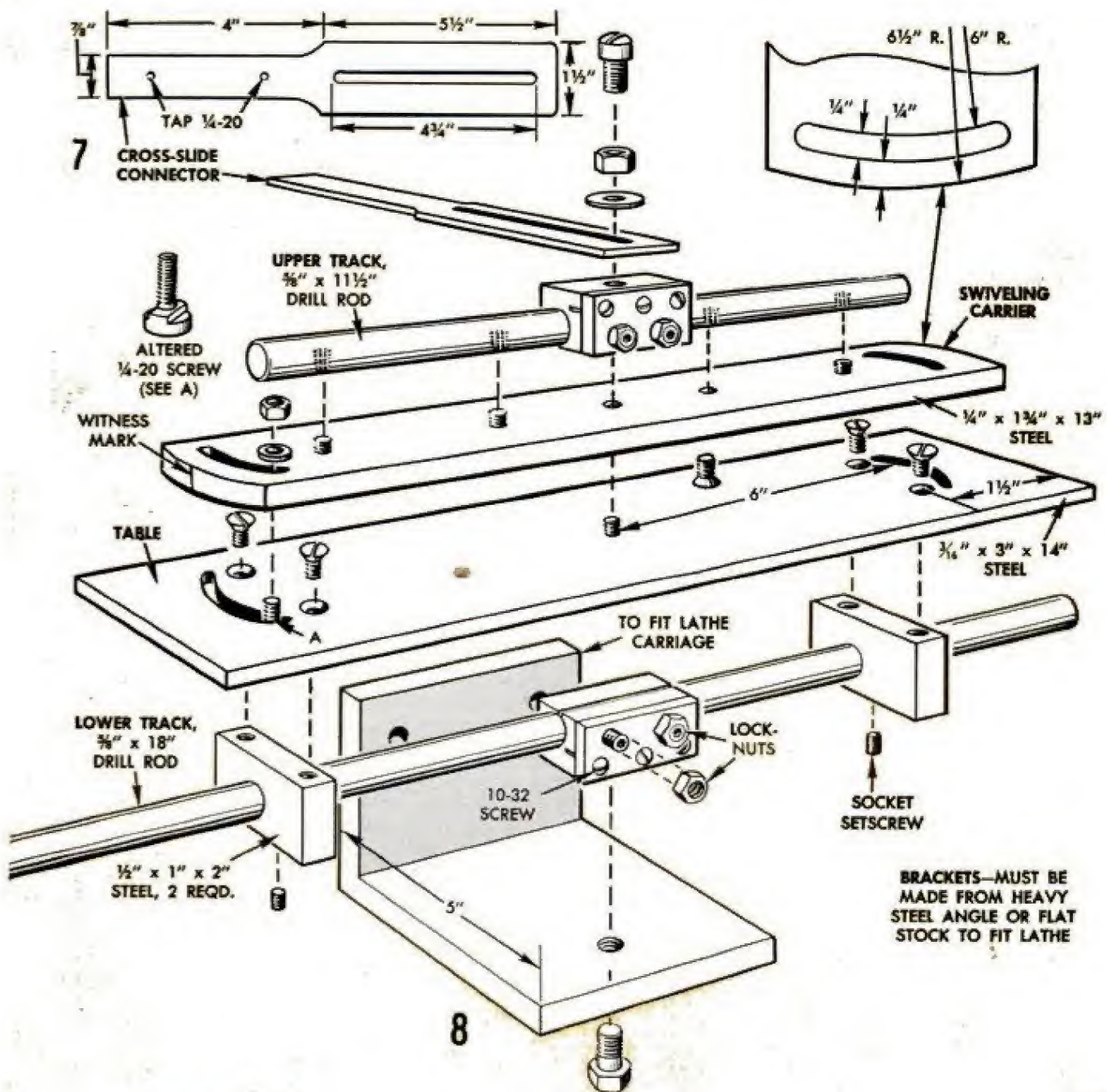
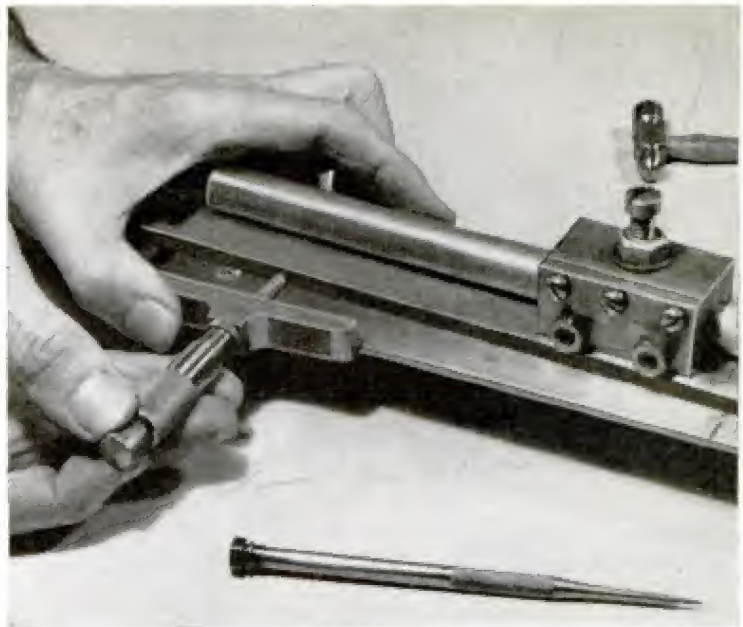




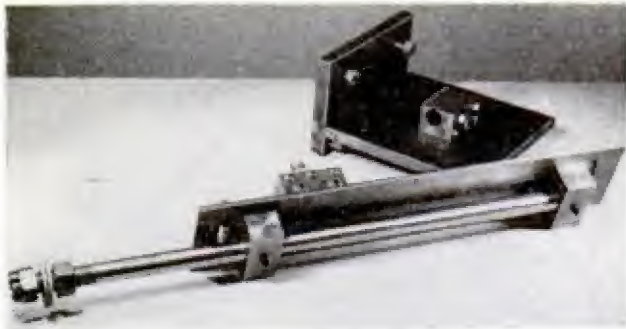
**6-A. DEPTH MICROMETER** is used to make close measurements when calibrating

out undersize with drill and hack-saw, the curved slots near the ends of the carrier and table can be finished with a rotary file (or milling cutter) as in Fig. 2. Each member is pivoted on a piece of hardwood which is locked in the milling vise. Then the work is hand-fed to the file or cutter.

Finished parts and partial assemblies are pictured in Figs. 9 through 12. In Fig. 11 the parts are set for a 1-in.-per-ft. taper. The first step in calibrating is to check alignment of the upper track with the edge of the carrier nearest the lathe and also alignment of the



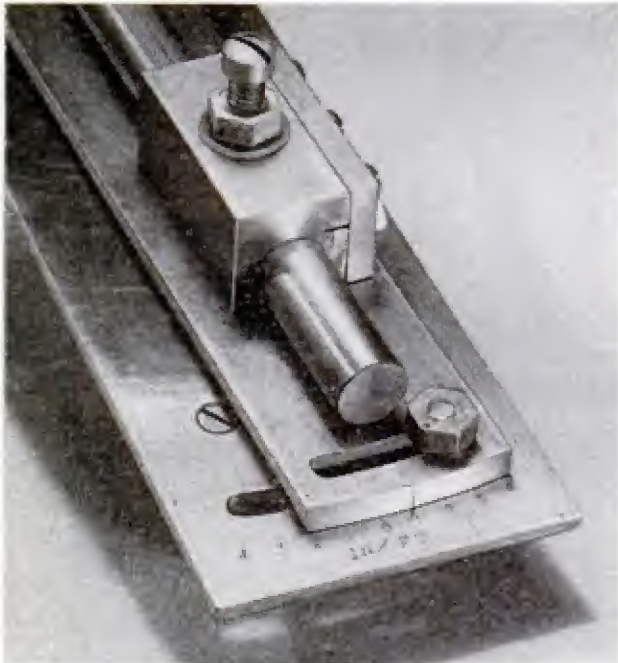




**9. TABLE AND ANGLE BASE** showing lower track and support blocks setscrewed to underside of table. Slide blocks are shown in relative positions on table and base. These parts are all made from stock materials

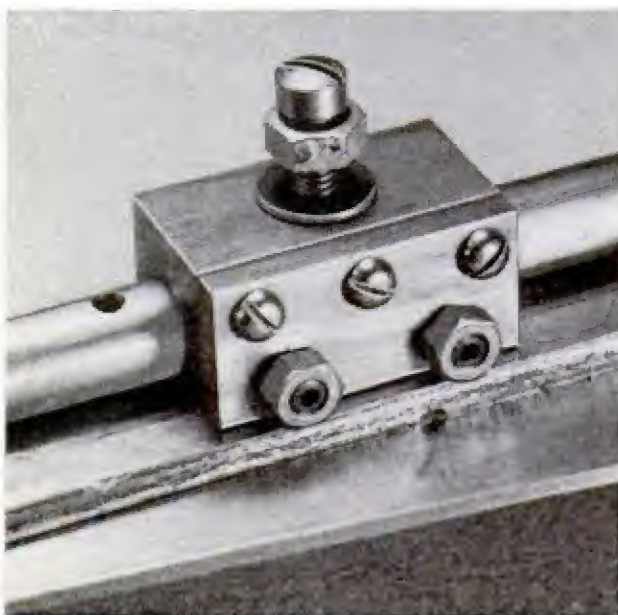


**10. CROSS-SLIDE CONNECTOR** is bolted to underside of lathe compound as in foreground. In background lower block is shown in position on built-up base. Slide block should be lapped to track with fine compound



**11. TABLE WITH CARRIER BAR** is set for 1-in.-per-ft. taper. Also shown is upper slide block in position

**12. UPPER SLIDE BLOCK** showing cover plate and screw holding connector. Note the hollow setscrews



lower track with the edge of the table nearest the lathe bed. The two check points should be 12 in. apart as in the upper detail, Fig. 5. Make a note of any variation. The index mark, or witness mark, at each end of the carrier bar moves along a scale which at one end indicates taper in inches per foot and at the other end in degrees of side angle (half the included angle). To lay out the taper-per-foot scale make two marks on the table 12 in. apart on the edge toward the lathe. With a depth micrometer, Fig. 6-A, measure, at the marks, the distance from the table edge to the edge of the carrier. At the zero (0) setting these measurements should be equal. For a taper of 1 in. per ft. the difference in the micrometer measurements will be  $\frac{1}{2}$  in. Make a scale mark to indicate this setting. Then lay off the graduations with dividers from  $\frac{1}{8}$  or  $\frac{1}{4}$  in. to 4 in. on each side of zero (0), Fig. 5, the upper right-hand detail. At the other end of the swiveling carrier calibrate a scale indicating to 10 degrees on each side of zero (0), using a protractor.

#### How Attachment Is Used

When the attachment is set up for use, the cross-feed screw on the lathe carriage must be either disconnected or removed entirely, depending on the lathe. Use the compound to control the tool feed. After setting the carrier to turn the taper desired, move the cross slide so the tool is in position to start the first cut. Then tighten the nut that locks the cross-slide connector to the upper slide block on the taper attachment. The slide block should be adjusted so that there is no play in its movement along the track. Back off the cutting tool so that it clears the work for each return of the lathe carriage. Use a slow feed for the final cut. Before starting to turn a taper either inside or outside, make sure that the attachment is held rigidly in place on the lathe, that all nuts have been drawn tight and the slides properly adjusted. Apply light lubricant to all sliding parts. ★ ★ ★

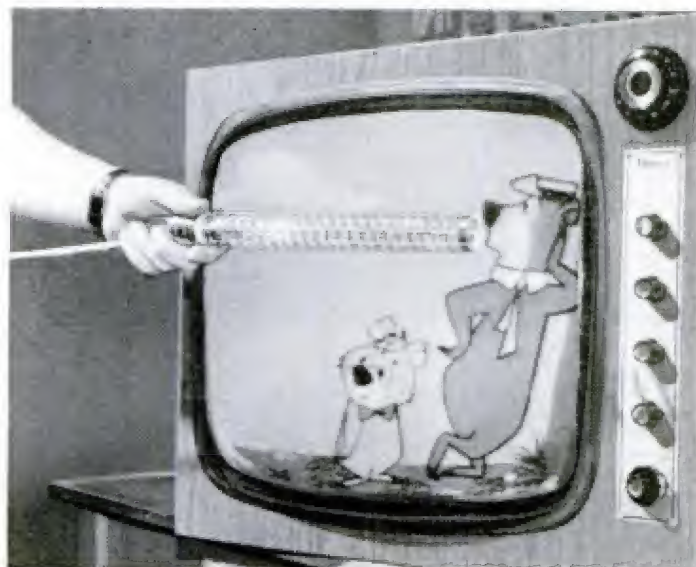


## Is Your TV A Radiation Hazard?

*... a special test report*

**By Dr. Jan Paul**

**Nuclear Consultant**



WITH THE current concern over excessive radiation exposure, we wondered if TV was having any ill effects. The X-ray tube and the TV tube are both radiation-emitting cathode-ray types.

In each test, a control was used. Three sets were utilized, using a new tube, a two year old tube, and a tube over five years old. The resultant films were subjected to densimeter analysis to reveal the degree of fogging.

Additional tests were run with dosimeters and scintillators with results that varified the film tests as follows:

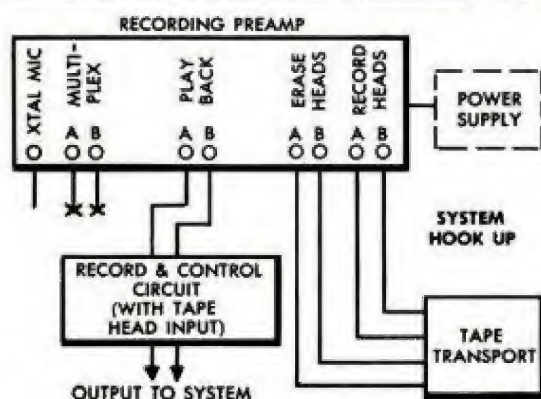
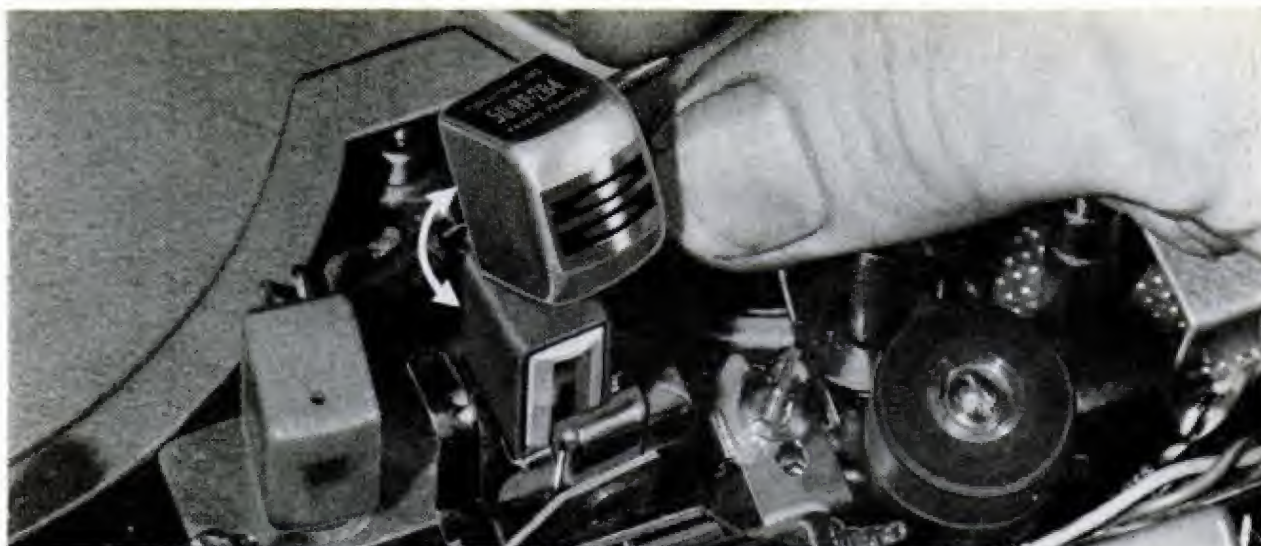
If a child kept his nose against the TV screen four hours every day, he would be exposed to less than .08 roentgens per year—less than half he receives from natural cosmic rays. Certainly this is a far cry from the 5 roentgens per year which humans can safely absorb, according to the International Committee on Radiation Protection. At any distance from the screen, readings were too low to be observed.

So if there is any hazard from viewing TV, parents will have to blame it on programming rather than the radiation, which is insignificant. ★ ★ ★

**FILM IS INSERTED** in paper strips taped to screen. A scintillator (photo above) verifies film findings







## Split Bias Design Means Lower Cost Stereo Conversion

**O**WNERS OF old tape recorders who want to convert to stereo have been faced with the unpleasant idea of starting, as it were, from scratch. This meant buying both the stereo recording amplifier and the tape deck. With luck, they could get a trade-in allowance on their old tape deck, but the savings were not substantial.

Now you can at last convert to a stereo tape deck for about \$25 and save most of the cost of buying a complete new stereo machine (about \$150). You are still faced, of course, with the problem of obtaining a stereo record amplifier, because the mono system in your old tape recorder cannot be converted. But here too, you can save as much as \$160 by building your own stereo record amplifier as we show you how to do here. And you can then enjoy those new stereo FM multiplex programs!

The first step in the tape deck conversion is to replace the tape head (see photo). We used a Fidelitone replacement kit which includes the stereo record-playback head, mounting plate hardware, the necessary matched oscillator and plate coils and

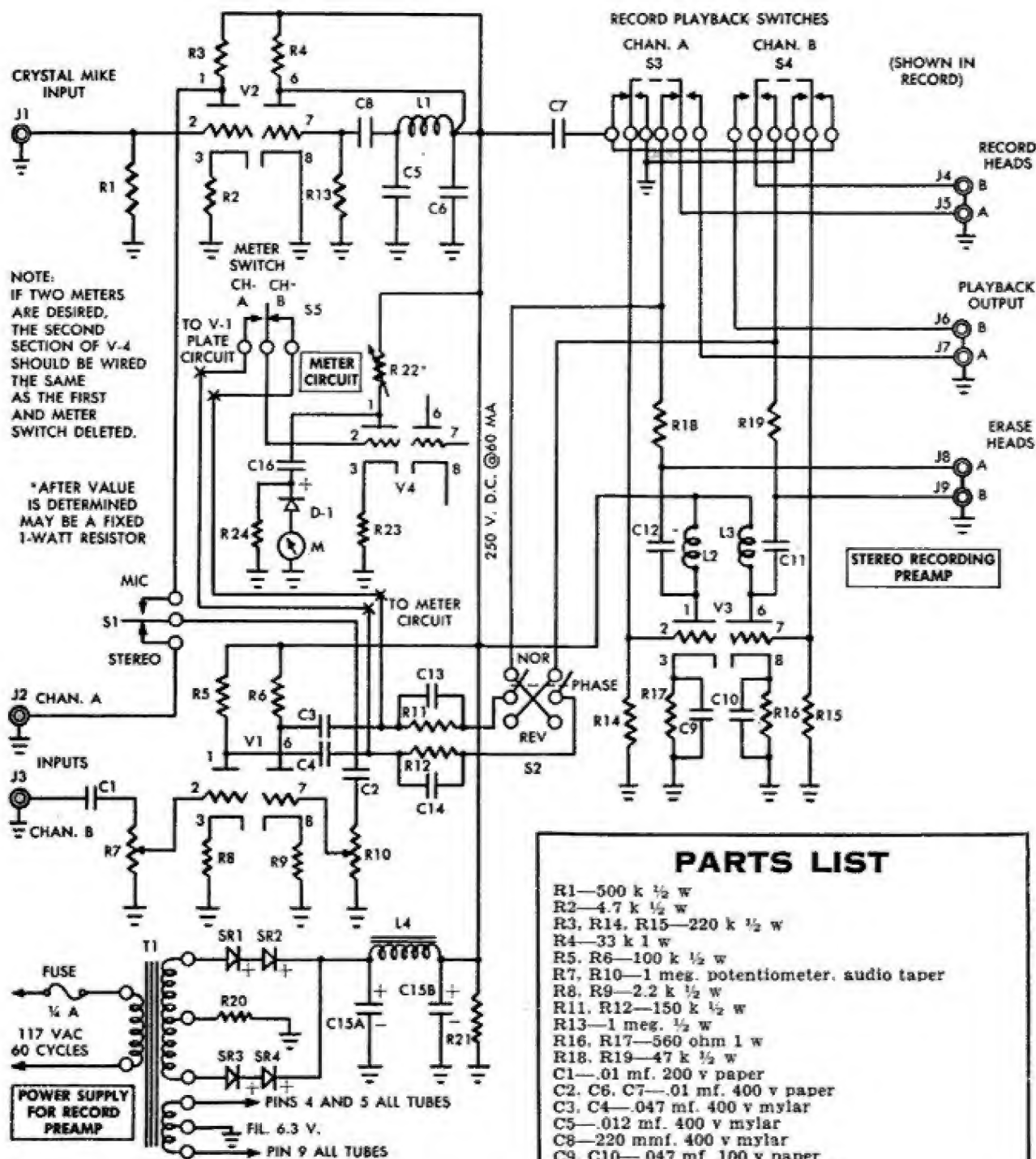
an alignment tape. You can order the kit by specifying your tape recorder model and make.

Remove the wiring to your old head. Then with a screwdriver, remove the head and clip the wiring out, as the old record amplifier will not be used.

If you avoid dressing power supply leads which carry a.c. this will cut down the possibility of hum pickup. The unit is plugged into an accessory socket on the tape deck or amplifier. This turns the record amplifier on and off with the unit it is plugged into. If you want a switch, however, add it between the fuse and the connection to T1. Substituting a 750-ohm, 10-watt wire-wound resistor in place of choke L4 will cut your costs about \$3. If installation space is a problem, you can use ganged controls with concentric shafts in place of R7 and R10 which are shown here as separate units. In wiring the unit, use shielded audio cable for all signal leads.

With the wiring complete, insert a stereo signal into J2 and J3. Set R7 and R10 to one-half rotation. If over or under recording results, reset these controls until a





## PARTS LIST

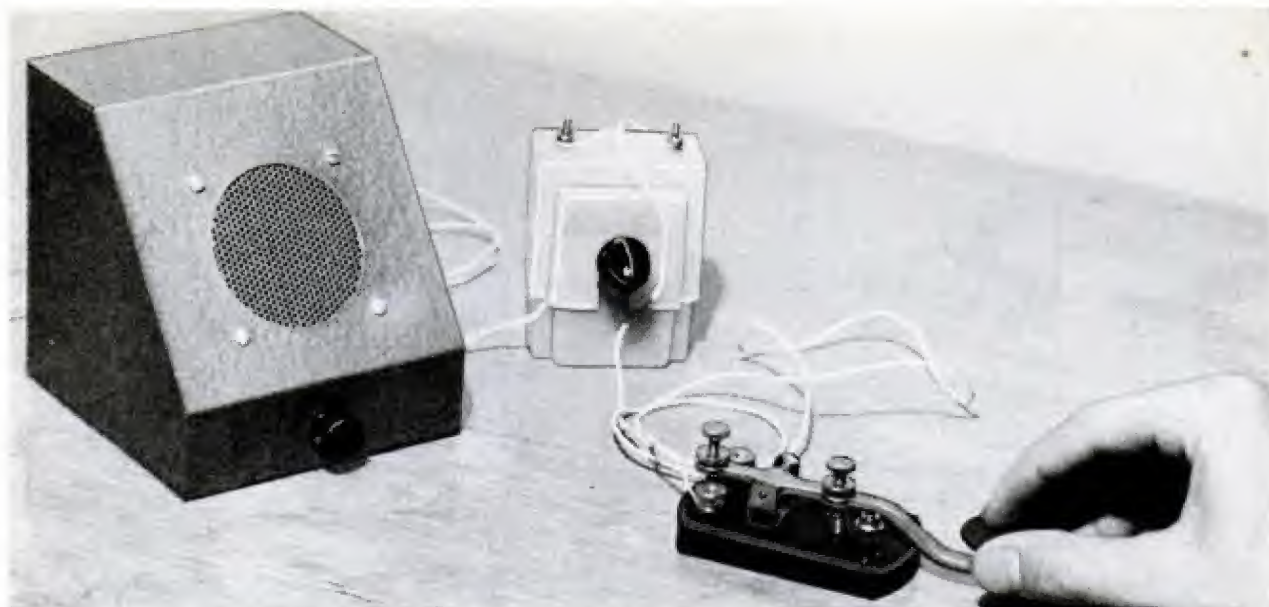
- R1—500 k  $\frac{1}{2}$  w
  - R2—4.7 k  $\frac{1}{2}$  w
  - R3, R14, R15—220 k  $\frac{1}{2}$  w
  - R4—33 k 1 w
  - R5, R6—100 k  $\frac{1}{2}$  w
  - R7, R10—1 meg. potentiometer, audio taper
  - R8, R9—2.2 k  $\frac{1}{2}$  w
  - R11, R12—150 k  $\frac{1}{2}$  w
  - R13—1 meg.  $\frac{1}{2}$  w
  - R16, R17—560 ohm 1 w
  - R18, R19—47 k  $\frac{1}{2}$  w
  - C1—.01 mf. 200 v paper
  - C2, C6, C7—.01 mf. 400 v paper
  - C3, C4—.047 mf. 400 v mylar
  - C5—.012 mf. 400 v mylar
  - C8—220 mmf. 400 v mylar
  - C9, C10—.047 mf. 100 v paper
  - C11, C12—.0047 mf. 600 v mylar
  - C13, C14—.001 mf. 400 v mylar
  - V1—12AX7
  - V2, V4—12AU7
  - V3—12BH7
  - S1—SPDT slide switch
  - S2, S3, S4—DPDT slide switch
  - J1 through J9—phono pin jack (Cinch Jones 81-A)
  - L1, L2, L3—Fidelitone Kit #1149
  - T1—Stancor PC 8403 or equivalent
  - SR1, SR2, SR3, SR4—Sarkes Tarzian P4 280 v at 750 ma silicon rectifier
  - L4—Stancor C 1708 or equivalent 13 hys at 65 ma. —or 750 ohm, 10 w resistor (see text)
  - C15A, C15B—40-40 mfd. at 350 v electrolytic
  - R20—10 ohm 1 w
  - R21—250 k 1 w
  - R22—100 k pot
  - R23—1 k  $\frac{1}{2}$  w
  - R24—5.6 k  $\frac{1}{2}$  w
  - C16—.1 mfd. at 400 v paper
  - D1—IN34A diode
  - M1—0-1 ma. meter, 2  $\frac{1}{2}$ "
  - S5—SPDT slide switch
- Punched, formed, prefinished chassis available from Experimenter Supply Co., 4301 S. Whipple, Chicago 32, Ill.

proper level is reached. Then adjust R22 for a meter swing of approximately 70 percent. This control can now be removed, measured and replaced with a fixed resistor, or left in for further adjustment.

Now plug the playback leads into a magnetic input on your stereo amplifier and insert the alignment tape. Put the unit on *Play* and adjust the screws at the sides of the head, which cause it to move away from the vertical. At the point where the loudest signal is heard, the adjustments are correct.

If the head is correctly aligned for playback, it is also aligned for recording. This system was use-compared with units in the \$250-\$500 price range and no appreciable difference could be detected.—R. M. Peters



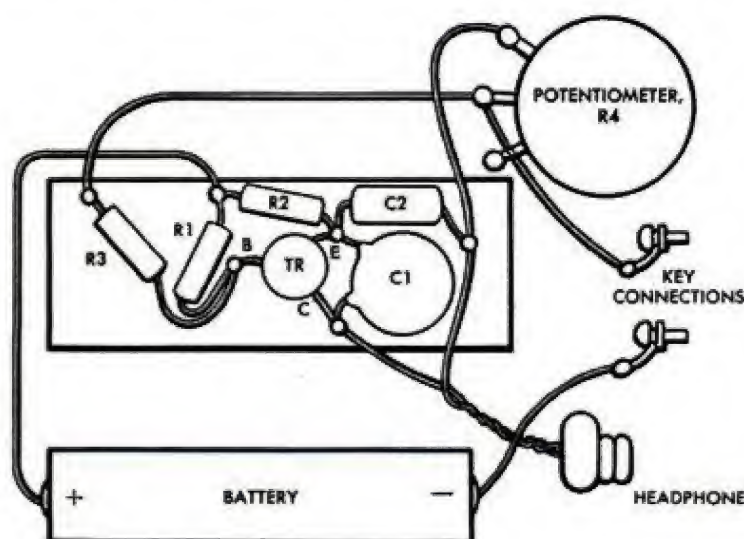


# Multi-Purpose Audio Oscillator

Code Practice • Radio Testing • Stereo Balancing



ALL PARTS (above) fit neatly into small cigarette case. The actual size diagram (below) can be used as a building layout



USE THIS handy pocket-sized oscillator with a telegraph key, and you can practice the code. Build two to connect between houses, and the kids can communicate while they learn the code.

For more volume, hook the earphone leads into any small amplifier having a 2000-ohm input, as we have done in the photo above.

Remove the earphone, replace the phone with a pair of paralleled phono plugs, and the oscillator can inject a tone signal into your stereo system to help you properly set the balance control.

If you connect the earphone output through a .01 mfd. capacitor, you can use the oscillator as a signal injector to test the audio portion of radios and television sets. Just apply the other end of the capacitor to the grid terminals of the tube you want to test.

—Otto Fried

## PARTS LIST

- R1—680 ohms,  $\frac{1}{2}$  w.,  $\pm 10\%$
- R2—2.7 k,  $\frac{1}{2}$  w.,  $\pm 10\%$
- R3—3.3 k,  $\frac{1}{2}$  w.,  $\pm 10\%$
- R4—Potentiometer, 50k, linear taper
- C1—.01 mfd. disc
- C2—.15 mfd, 200-v d.c.; paper
- TR—2N217, RCA
- B —5.0-v battery, Mallory TR-164 or any other between 3-6 v.
- Phenolic board 2" x  $\frac{7}{8}$ "
- Cigarette case, hardware, etc.
- Phones—Magnetic 2k



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WELLER ELECTRIC CORP., EASTON, PA.

## Pressure Caps and Thermostats

(Continued from page 125)

erly unless that specific pressure is maintained. For this reason never install a pressure cap of a higher or lower rating than that allowed for when the system was designed. Fail to follow this rule and you've got trouble—lowered cooling efficiency, possibly a blown hose or even a head gasket, especially if the rating of the cap is much above that specified for your car.

Present-day pressurized cooling systems require a closer watch for coolant leaks. Improperly torqued head bolts, incorrectly seated hose clamps, any loose connections between blocks and radiator may not allow perceptible coolant leaks but may permit air to be drawn into the system, resulting in what is known as aeration. When air bubbles form in the coolant due to aeration its efficiency is greatly reduced. For this reason Saturday Mechanics should own a torque wrench and go over all bolts in the system periodically to assure that uniform tension is being maintained in accordance with the recommendations of the manufacturer of the car. ★ ★ ★

**SOME GAS AND OIL ADDITIVES** make your car run better. Learn how in Booklet 207, only 35c from Popular Mechanics Service Bureau, Room 532, 200 E. Ontario, Chicago 11, Ill.

## Home Fitness Gym

(Continued from page 159)

will extend 16 in. which provides a maximum pull of 40 pounds. Along with friction of the rollers a total pull of 90 pounds or more is exerted on the operator's arms. Screen-door springs are not recommended for the coil springs as they are too light even if several were used. The seat, detailed in Fig. 2, is made of  $\frac{3}{4}$ -in. plywood and is fitted with ball-bearing skate wheels positioned between double skirts. Note that the latter extend below the rails to keep the seat on the track. The edges of all the parts should be rounded to avoid slivers.

To row, brace the legs straight against the footboard and with the seat pushed all the way back, grip the strap handle and pull it toward you, at the same time bending the knees and letting the seat roll forward. At the completion of the full stroke, release the spring tension slowly, at the same time straightening the legs and pushing the seat back to its original position. Workouts of just a few minutes each day go a long way in strengthening leg muscles, reducing hips and thighs and flattening the stomach.

(Continued next month)



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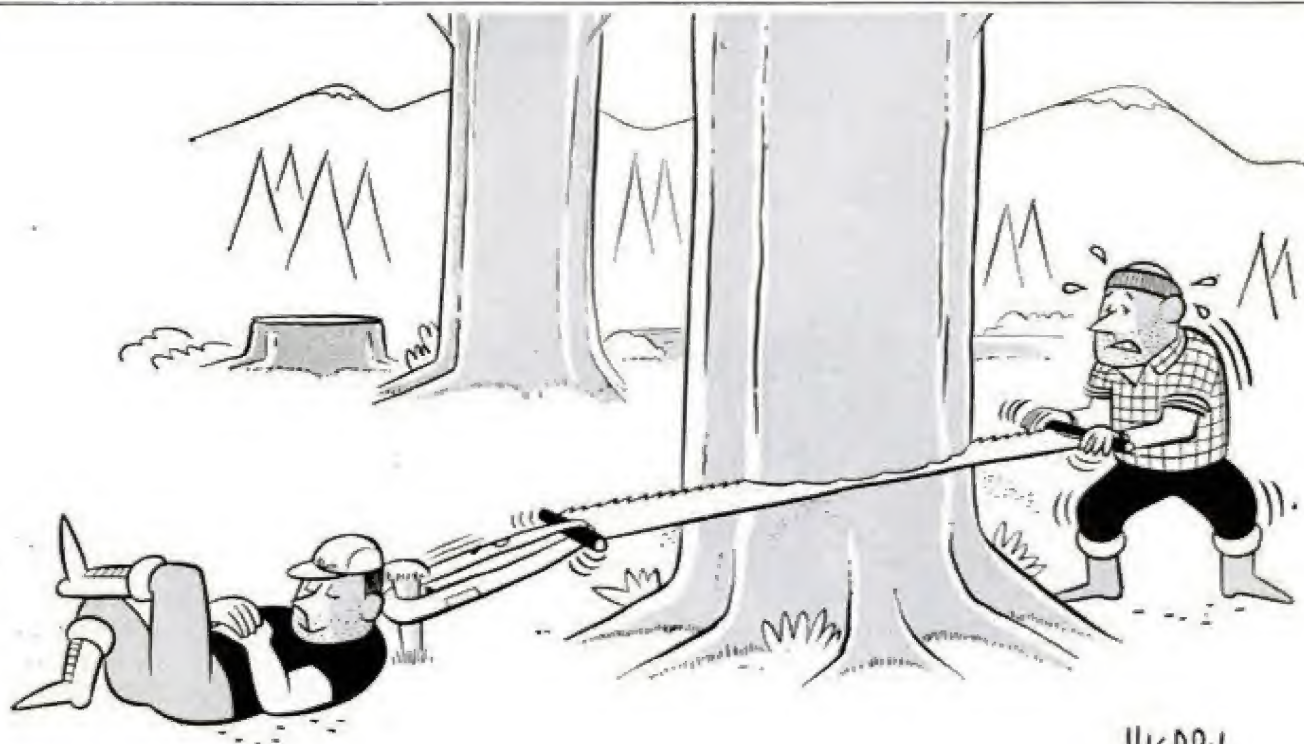


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# CLINIC FOR HOMEMAKERS

As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—editors of Popular Mechanics invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11, Ill.

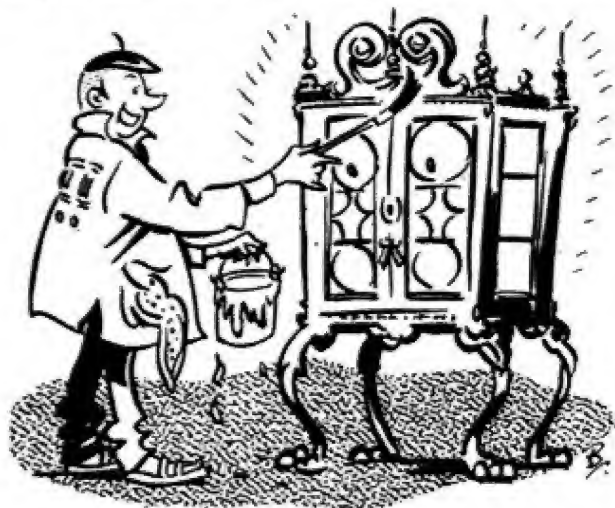
## French Antique Finish

**Q**—We bought a secondhand set of dining room furniture in an ornate pattern. The pieces are all in good condition, except the finish isn't so hot. We'd like to do them over in a white antique effect, but how should we apply the finish?—H.B., Ind.

**A**—There are several good finishing schedules that will produce the French antique effect you have described. The main purpose for using such a finish is to give a piece of furniture the mellowed appearance of age. Here is one finishing schedule which has given excellent results, and the finishing may easily be varied to suit individual tastes.

After the old finish has been removed and the surface sanded, a flat or semiglossy off-white enamel is applied to the entire surface. Once this background finish is thoroughly dry a glaze coating is spread on with a paint brush. For this you can use a bronzing powder mixed with bronzing liquid or raw umber tinting pigment in oil thinned with turpentine.

The glaze is applied to the decorative carvings, then wiped off immediately with a lint-free cloth, leaving color in the low spots of the carvings and corners as desired. Final blending may be accomplished with a dry brush, working from the center towards



the edges. For the finishing coat, apply a clear, dull-luster varnish or a similar finishing material.

## Street Noises

**Q**—Traffic in our neighborhood was rerouted last summer, and now we get a lot more noise and traffic along our street. The noise hasn't been so bad since we closed the windows last fall, but we'd like to know how we can reduce the noise that is coming into the house, especially during the summertime? One of our neighbors plans on building a brick wall in front of his place to deaden the sound, but we can't afford anything like that. What would you suggest?—W.D., Conn.



**A**—Sounds originating outside a house are more difficult to control than those originating inside, but there are many ways of reducing these outside intruder noises and still not have to spend a fortune.

Probably the least expensive and most effective noise barriers against street rackets are shrubs, thick hedges and trees grown between the street and house and set out in attractive groupings to absorb and deflect unwanted sound.

Wooden fences forming baffles that both gobble up and deflect sound are also effective noise barriers, especially when combined with thick climbing vines.

But a tightly built modern house, which is thoroughly insulated and weather stripped, is your best sound barrier. Heavy drapes at the windows will help muffle the noises coming through the glass areas. By using double-glazed windows and keeping them closed throughout the year (this means air conditioning the house during warm weather) you will be using one of the most effective means of keeping noises at bay.





## Catalina: Stormer out of Pontiac

This one comes on with a rush: a new breed of "Cat" from Pontiac. Touch toe to throttle and watch that Trophy V-8 gobble up road. Arc the wheel and feel Pontiac's Wide-Track unbend the curves. Driving a Catalina is a real kick. No question about it. And a good-sized chunk of the fun comes from the things you choose yourself. Engine power: it ranges from a thrifty 215 h.p. rig to the 348 h.p. Tri-Power screamer. Transmission: standard three-speed manual. Optional at extra cost: four-speed, floor mounted stick or Hydra-Matic. You can tailor this baby to your tastes all the way back to the rear axle ratio. And you'll like the basic package, too. The Catalina is slightly longer this year. (Wheelbase has gone up to 120".) The turning circle is tighter for sharper maneuvering. You'll go for its looks, light handling and lightning action. Check with your Pontiac dealer. He's a man after your own heart. And make it soon! Pontiac Motor Division — General Motors Corporation.





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## Ten-Minute Film Dryer

(Continued from page 185)

can outlet and to the blower, Figs. 2 and 5, so it will exhaust the moisture-laden air outdoors. The flexible hose used here was an extension hose for a shop vacuum sweeper. With the heater switch in the off position, plug the cord into an outlet. Insert a long-stemmed dial thermometer into the dryer through the hole for the thermostat wires as in Fig. 5 and turn the thermostat on about a quarter turn. Now flip the heater switch to on. The red pilot light will glow and the tape will heat up. As soon as the thermometer reads 120 degrees F., slowly turn the thermostat control toward the off position until the red light goes out. Plug in the blower and cool the dryer until the pilot light goes on again. Unplug the blower and let the temperature rise until either the red light goes out or the thermometer indicates 120-degrees. If the latter, readjust the thermostat slightly. Repeat this until you are certain the thermostat works at 120-degrees, then the dryer is ready for use. ★ ★ ★

## Automatic Bicycle Transmission

Eliminating handle-bar controls and cables, a new bicycle transmission with a two-speed gearshift is contained entirely in the hub of the rear wheel.

It has a low speed for starting or hill climbing, and a "cruising" speed. A shift from one to the other is accomplished by back-pedaling about two inches.

Also, when the brake is applied, regardless of which forward gear is being used, the unit utilizes the gear ratio of the low-speed shift, which reduces pedal pressures by half, giving the effect of a power brake. The transmission was developed by the Bendix Corporation.

## Tape Controls Giant Gauge

So sensitive it can detect a change as small as 10 one-millionths of an inch in the inside and outside measurements of a part, a 16-ton gauge system is controlled by punched tape.

The universal, five-axis measuring machine is capable of inside, outside and thickness measurements of parts of any shape. Used to measure such critical items as a missile nose cone, it can complete almost 1000 measurements in two hours under the direction of a punched tape. It would require about a month to make the same measurements by other means.

The gauge is made by the Sheffield Corp., Dayton, Ohio.





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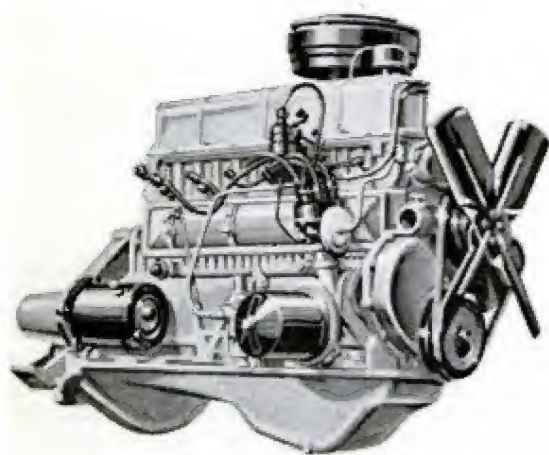
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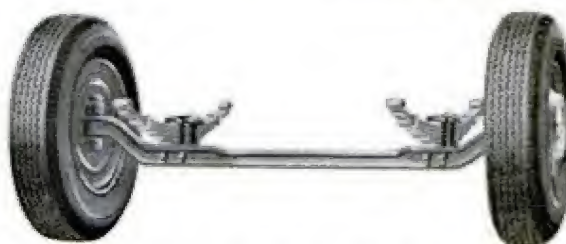


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## How to Outwit an Ouzel

(Continued from page 151)

If the camera being used is equipped with a regular leaf shutter, of course, a properly rated electronic unit would be suitable for almost all situations as long as it was not too heavy. Remember that you will frequently be led into rough terrain if you intend to follow the birds very far. Also, remember that with flash you will probably get only one picture at a time. Most birds depart at first when the bulb pops, but become used to it later. The shorter flash of an electronic unit does not disturb them as much.

### Outsmarting a Wary Ouzel

Let's translate all these do's and don'ts into an actual case. This past winter the author set out to photograph one of the most interesting of western birds—the dipper, or water ouzel. This little sparrow-sized bird, although not a water bird as such, has the unique ability to walk on the bottom of mountain streams, clutching the rocks from which he plucks nymphs and other larvae. Unfortunately for the photographer, his coat does not match his colorful ways, being completely gray.

Since feeding stations and/or cameras at the bottom of an icy mountain stream are impractical, the only way to approach the ouzel was by simple stalking through difficult terrain. Also, since he was quite small, very active, and usually frequented the shade, a telephoto lens mounted on a bellows with a flash unit attached seemed to be the answer. Using this rig and much patience, theoretically, would produce good shots of the ouzel.

Making this a reality, however, involved several other things, most important of which was a familiarity with the subject. Few people will try to photograph an auto race, a football game or a movie star without learning first what angles or positions might be best and what might be risky. So it is here, and for really good bird pictures the photographer is advised to obtain a copy of one of the excellent natural history books available in any library. The Audubon Society, at 1130 Fifth Ave., N.Y., is an inexhaustible and cheap source of information about all birds.

Thus armed with much written information on the ouzel, the writer sought out the bird—and soon found that much remained to be written. For one thing, although all the writers had explained that the ouzel was called a dipper because he dipped up and down constantly, none of them had mentioned that this dipping occurred with a surprising regularity, exactly once a sec-

ond. Until the photographer learned this, and timed his shots to occur between the dips, the results were somewhat blurred. Other birds move with the same regular, quick movements, ranging from twice or three times a second for a wren to long intervals for crows. Predatory species such as the hawk and owl lack these rhythmic movements, as do most water birds.

With the coming of spring, the ouzel nested, and the approach shifted accordingly. Flash was provided by an electronic unit attached to the forest footbridge under which a nest was situated and the photographer was concealed in a natural blind at the edge of the stream. Another flash was focused a short distance away from a rock, on which every bird stopped as it bore food back to the nest. Having ascertained these things about the ouzel beforehand, including its pattern of flight, its length of stay at the rock and the nest, a good photographic record of its life could be obtained, whereas a person blind to the bird's habits might have obtained one picture but certainly no more.

The total cost of the ouzel effort was many rolls of film, obtained cheaply by buying it in bulk and respooling it at home, a lot of pleasant time afield, plus a certain amount of penicillin needed to get rid of the pneumonia acquired while crawling through snowbanks. The reward: some excellent shots of a fascinating bird which showed not only the bird itself but proved the fact that the photographer was able to obtain them. Pneumonia is not an inevitable part of bird photography, but the pleasure which comes from a really good picture is always a sort of triumph. Now that the expense has been removed from this challenge, the field is wide open to anyone with the yen and the energy. ★ ★ ★

---

## Man's Time in Space Limited By Food He Can Carry

Storage and weight, rather than nutritional content, are the major factors in space feeding that will limit the time man can spend in space, according to a nutritionist for the National Aeronautics and Space Administration. Each pound of dry weight placed in an earth orbit requires 10 pounds of propellant to get it off the ground. With current launching capabilities, a short round trip to the moon is possible, but a year-long trip to Venus or Mars is not. An adequate supply of ready-to-eat, prepackaged foods would amount to about 1300 pounds per man per year of flight for such a journey which, at present, is economically unfeasible.



## Triple-Top Fun Table

(Continued from page 171)

from the ends, the two other screws being equally spaced between the end ones.

At this stage the assembly is ready for attachment of the top rail, Fig. 18. Spacing of the countersunk holes for the screws which hold it is given in Fig. 15, the spacings being located on the center line of the rail. Drill the body holes for the No. 10 screws all the way through, then use a 1/2-in. countersink, running the latter just deep enough to allow only 1/16-in. above the screw head when the screw is drawn tight.

### MATERIALS LIST

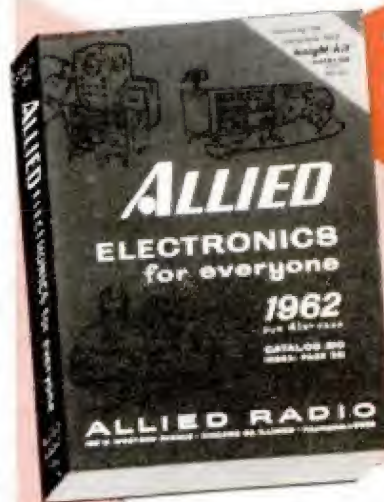
(All dimensions in inches)

- 2 pcs.—3/4 x 1 x 42 1/4—Cushion clamping strip—ends
- 2 pcs.—3/4 x 1-9/16 x 42 1/4—Cushion rail riser—ends
- 2 pcs.—3/4 x 1 1/4 x 37 3/4—Cushion rails—ends
- 4 pcs.—3/4 x 1 x 43 1/8—Cushion clamping strip—sides
- 4 pcs.—3/4 x 1-9/16 x 43 1/8—Cushion rail riser—sides
- 4 pcs.—3/4 x 1 1/4 x 38 3/4—Cushion rails—sides
- 6 pcs.—3/4 x 4 1/4 x 4 1/4—Head corner pocket fillets
- 4 pcs.—3/4 x 3 x 4 1/4—Foot corner pocket fillets
- 2 pcs.—3/4 x 1 3/4 x 4 1/2—Side pocket fillers
- 12 pcs.—3/4 x 2-1/16 x 2-1/16—Corner pocket fillers
- 4 pcs.—3/4 x 2 7/8 x 4 1/2—Flap holders
- 4 pcs.—3/4 x 4 1/4 x 4 1/2—Flap holders
- 1 pt.—Liquid hide glue (Franklin)
- 1 lb.—Plastic resin glue—powdered (Weldwood)
- 1/2 pt.—Super strong glue (Allens)
- 1 set—Rubber cushions—For 4 x 8 table
- 1 pc.—48 x 96—Billiard cloth
- 6 pcs.—5 x 48—Cushion cloth
- 7/16 #4—Carpet tacks
- 12 Rubber cushion facing
- Flexible plastic countertop material—**BOLTA-FLEX**  
(**BOLTA CO.**  
**LAWRENCE,**  
**MASS.)**
- 1 pt.—Contact cement
- 1 1/4 x 10—F.H. wood screws
- 1 1/2 x 10—F.H. wood screws
- 2 1/4 x 10—F.H. wood screws
- 6 #2-1/2 Tin cans
- 1 1/2 doz.—1/2—Pearl spots

The screw heads are capped with pearl sighting disks, or spots, as they are often called, which you buy ready-made. They are slightly under 1/2 in. in diameter. The disks are thus loose-fitted purposely, the loose fit permitting them to be lifted out readily when it is necessary to disassemble the parts for replacement of worn or damaged felt on the bed and cushions. In the final assembly of the rail, after painting, a tiny spot of putty placed on each of the screw heads will hold the sighting disks in place yet permit removal when necessary.

The next step toward completion of the top is the making and fitting of the end and side-pocket boots, Fig. 27. Each boot is made from a No. 2 1/2 tin can and lined. The lining material is the same as that used in the ball returns and is applied with contact

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oil rings stop oil pumping

cement. Note that the top edge of the lining material is bent over the lip of the can section. Only the end-pocket boots are notched and bent as detailed in Fig. 27 and shown in the adjacent photo. Edges of the side-pocket liners are cut straight as indicated in the photo at the right of Fig. 25. Here the can is first formed oval shape and then cut. Approximately one half of the can is required, actual measurement being taken between the ends of the cushion facings against which the cans hook. Once fitted, the pocket boots are removed, each one being marked so that all six can be replaced in sequence. Now, remove the rail assembly consisting of the top rail, the assembled parts A and B and the clamping strip. Remove the cushion rail from the riser, again marking the parts so that they can be reassembled in sequence. Cover the felted bed with heavy paper to keep it clean, also to protect it from overspray when painting. Trim the paper to the full size of the bed so that the edges will extend under the clamping strips. Reassemble by placing the bed back in position, replacing the clamping strips, the risers and the top rail, but omitting the cushion rails. In this temporary reassembly of the parts, turn the screws in only moderately tight as the parts must again be disassembled after sanding and painting. Part III next month will describe making the storage base.

---

**MODERNIZE ROOMS** with plywood wall paneling. Simple instructions in Booklet 205, "New Rooms for Old," only 25c from Popular Mechanics Service Bureau, Room 532, 200 E. Ontario, Chicago 11, Ill.

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## Ceramic Ignition System Pumps Out Steady Charge

Using a switch and a spark plug, a new "spark pump" is said to out perform conventional ignition systems using coils, condensers, points and a host of other parts. According to Clinton Engines of Cleveland, Ohio, the device operates on the principle of *piezoelectricity*, the same principle used in crystal radios and phonograph tone arms. The "spark pump," however, uses a ceramic element in place of the usual slice of quartz crystal. Under a steady pulse of pressure the element is said to emit a constant charge of 20,000 volts at low amperage, regardless of engine speed. Extensive tests promise an end to ignition troubles on power mowers, generators and other small gasoline-powered equipment and manufacturers hope further developments will see wider, more extensive uses for the "pump."



# Weather Station Is Powered by Isotopes

Meteorologists will obtain weather observations from a remote area in the Canadian Arctic by means of an isotope-powered automatic weather station.

It can function up to two years unattended. The station and power source are housed in a cylindrical, insulated container approximately eight feet long, five feet of which will be buried in the permanently frozen ground.

An anemometer, thermometer and barometer will gather information which, supplied to a data processing system, will

go to a radio transmitter for relay, every three hours, to manned stations to the south.

The power source, located at the base of the container, is a strontium-90 heat generator with thermocouples, batteries and a converter. Excess heat from the atomic isotope maintains an interior operating temperature of some 70 degrees F. This element produces thermo-energy to charge a nickel-cadmium storage battery system, which in turn activates the radio transmitter.

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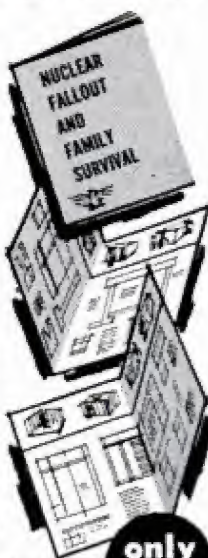
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## Metallic Brake Linings

(Continued from page 119)

squeak immediately before coming to a dead stop, which although barely noticeable, was still there. None of the linings exhibited squeal during braking.

Out of curiosity, PM sprayed hydraulic brake fluid in one drum and shoe set each of the Velvetouch and old Ford linings. The Velvetouch brakes did not grab and would lock evenly. The asbestos linings showed intermittent grab and chatter. Both sets showed evidence of having been well sprayed when they were removed. This would indicate another bonus factor for the sintered metallic linings.

### Lining Life

The Velvetouch linings showed .003 wear (average of twenty readings taken around the shoes). This .003 wear was the result of approximately 200 miles of driving, including two sets of 16 fairly rugged and consecutive decelerations from 70 to 40 m.p.h. and 50 decelerations in the 70 to 40 range, plus the slower water-fade tests, plus the normal braking requirements for the 200 miles of driving.

PM's estimate is that the normal driving equivalent of this amount of driving would be in excess of 600 miles, and based on the 1/4-inch of lining thickness being only partially used, that puts lining life in excess of 25,000 miles.

Velvetouch Metalik linings showed much less tendency toward high-speed fade than did the conventional asbestos linings, and after break-in they showed almost no tendency to fade in our test.

Water immersion caused much less fade on the average than it did with conventional linings, and braking was even at all four wheels. The Velvetouch linings squeaked very slightly after the high-speed fade tests, but did not chatter.

While PM did not prove or disprove that the Velvetouch linings have superior life, a long, if not superior life is indicated. The price for a '60 Ford is \$15.86 per set (two wheels) compared to \$12.50 for stock Ford replacement linings. ★ ★ ★

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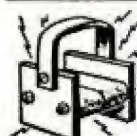


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## Automation

(Continued from page 131)

coming. The Federal government and the Labor Department are trying to find ways to help. In the past few months a new Office of Automation and Manpower was organized in the U. S. Department of Labor to find some of these answers. We have called upon leaders in labor, business and education to sit on a special Advisory Committee on Automation to work with the new office on this problem.

Under the recently-passed Area Redevelopment Act, we are pushing a comprehensive program to lift whole communities out of depressed job conditions, giving management incentives to build or expand operations in so-called depressed areas and giving workers the opportunity to retrain for new jobs within their own communities.

We have placed before the Congress a Manpower Development and Training bill which would make maximum use of existing training programs, methods and facilities and also stimulate much needed expansion of these programs and the development of improved, new, and diversified programs.

## Youth Employment Bill

We have also placed before the Congress for enactment a Youth Employment Opportunities bill, with three approaches for men and women between 16 and 22 years of age. One offers on-the-job and related training programs, including classroom instruction, to improve the employability of young people and to enhance their chance of advancement in the future.

The second part provides employment and training programs in the so-called public-service, public-work area. It would develop training opportunities for young people for experience with state and local agencies, such as schools and hospitals, as well as in conservation and similar work.

The third portion would set up a Youth Conservation Corps, a camp-oriented program in which the 17 to 22-year-old trainees would perform conservation work for \$70 a month as well as subsistence and equipment, transportation, etc.

As you can see, the Federal government, with the aid of the states and local governments, is making a concerted national effort to lift up the skills of the nation and provide economic opportunities for all.

At this juncture we are sure of one thing: The skilled worker must have the flexibility, the maneuverability and adaptability to survive. To have these three qualities, you must be ready and willing to improve your skills. ★ ★ ★



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# The World of Solid State

(Continued from page 90)

state physics has been a subject under study ever since mankind learned that all matter came in solids, liquids and gases. The excitement today has to do almost entirely with curious and useful electrical properties in certain solids. A better name for it, suggests General Electric's Rudy Koehler, might be solid-state *electronics*. "Basically," he says, "we deal in electrical engineering because we are involved with charged-particle phenomena."

Useful electrical properties in some solids have been known for more than a century. But it wasn't until three Bell Laboratories physicists — W. H. Brittain, W. O. Shockley and J. Bardeen — perfected something called a transistor in 1948, that the new science of solid-state physics really took off. Half a dozen years later, semiconductors and other solid-state devices began spewing over a bewildered public like Roman candles at a Fourth of July picnic.

What are these gadgets? What do they do, and why?

## Odd Behavior

In all solids, atoms are held in a rigid crystal framework called a lattice, bound to their neighbors by positive or negative electrical charges. The odd behavior of these charged particles in certain solids is the secret of the whole business. Some react to electricity in unique ways, some to light, some to heat and cold, some to magnetism, some to twisting and bending.

In a good conductor like copper, the atoms are associated with particles bound to them loosely. These particles can move through the lattice, jumping from atom to atom, and can be used to carry an electric current. Other solids like diamond have no free particles and can't carry electricity. They make good insulators.

A few special materials, however, such as silicon and germanium, are fair insulators in their pure state. But if they are doped with certain impurities, they acquire free charges and become conductive. These are the semiconductors that are causing so much flurry.

The trick lies in the doping — baking, growing or diffusing the impurity into the crystal. If silicon, with four electrons per atom, is doped with arsenic whose atoms have five electrons, the extra arsenic electrons become freewheelers in the tight crystal lattice and are available to carry current. This makes a negative, or n-type semiconductor. But if silicon is doped with aluminum, which has only three electrons, so-called holes are left in the crystal struc-

ture. Holes have a handy way of absorbing free electrons moving through the crystal, then reappearing. In a way, current jumps from hole to hole in this p-type crystal.

By arranging n-type and p-type regions in different areas of a single crystal, scientists have been able to make tiny bits of semiconductor material perform all kinds of fancy electrical tricks that previously required quantities of bulky tubes and gear snarled in a maze of wires. Simple two-region diodes the diameter of a pin prick can take an alternating current in one end and send it out the other as direct current.

A diode can act as a one-way electrical gate in switching and do other useful jobs. A three-region transistor, which really is two diodes back-to-back and may come in sizes down to pinhead diameters, is more sophisticated. It won't conduct electricity until a tiny current applied to the middle region of the sandwich excites the electrons in the crystal (see diagram on page 90). Then, the main current can come through. En route, it picks up the characteristics of the weak control current *and becomes an amplified version of it*. Some transistors can increase a control current 40,000 times! This is the basic magic of electronics — a small current controlling a bigger one. By adding one transistor atop another, a trickle of current from a diminutive power source can be multiplied billions of times until it achieves enough energy to flip a switch in a garage door opener, or run a loudspeaker from a hi-fi pickup's weak signal.

## Complex Circuits in Films

By combining a dozen or more n and p regions in a single crystalline arrangement laid out on a silicon sheet by a process called sputtering, solid-state scientists are already creating highly complex circuits called thin films. A single one of these fantastic gadgets may contain six transistors, as many diodes, plus a number of other features. It can take an electric current and switch it, amplify it, split it up, change its voltage and work it over a dozen different ways. And all this happens in a device the size of a postage stamp one micron thick. These little gems can be stacked to create complete electrical systems. Yet many physicists consider them only an interim device. The ideal solid-state goal is a single, solid crystal with all the discreet regions necessary to do the same job doped right into the crystal structure. Both Westinghouse and Texas Instruments are already producing laboratory versions of these electronic goodies, known variously as molecular blocks, molelectronics devices,

(Continued to page 224)



# New Rambler "E-Stick" rated big '62 auto news



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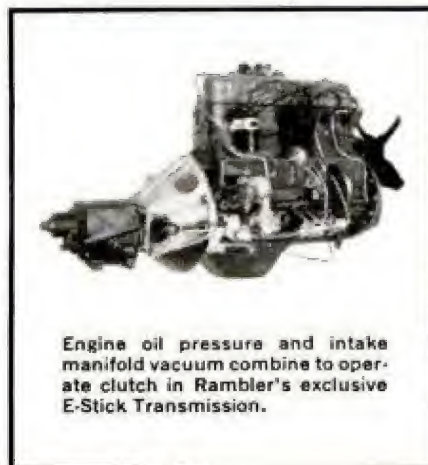
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This is but one of many Rambler advances for '62. Rambler progress sharing brings

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monolithic blocks, or solid circuits, depending on which company you visit.

"The day is almost here," says John Stelmark of Westinghouse, "when to make a radio or TV set, you will pull six to twelve solid crystals—each about the size of a shirt button—off the stockroom shelf and connect them up. A thousand such blocks plugged together will build any kind of a computer some day. We already have one-chunk oscillator blocks, detector blocks, logic gates, complete radio amplifiers and preamps."

Far more important to electronics engineers than the miniaturization fantasies these devices conjure up, is their tremendous reliability. There are no wires to short out, no soldered connections to break. And they have the endurance of Methuselah. "We have transistors on life test exceeding 26,000 hours," reveals H. Brainard Fancher of General Electric. "That's nine years of operation eight hours a day; commercial vacuum tubes have an expected life of 80-percent survival after 1000 hours." Fancher's group even fired a bunch of solid-state circuits from a mortar one time to test their ruggedness. "They worked afterwards," he reports. "The shock they had withstood was about 15,000 Gs."

### Pea-Size Preamps

Today, at Westinghouse, John Stelmark can show you a five-watt amplifier that looks like a button from your jacket and a preamp resembling a pea. Between them, they perform the same job done by the two shoebox-size affairs that power a modern deluxe hi-fi. And they produce first rate sound. A complete flip-flop circuit, used in high-speed computer switching, now comes in a delicately etched solid crystal smaller than the "D" on a dime.

That's not all. By operating monolithic blocks called *cryotrons* inside bottles of liquid helium at -450 degrees F., physicists can make their circuitry superconductive. At that temperature, all electrical resistance in matter disappears, and even the smallest trickle of current moves forever, close to the speed of light. Switching in a cryotron is accomplished in billionths of a second. In complex military tactical problems, requiring days of computer programming to solve, hours can be saved by shaving fractional seconds from each step in the system.

Superconductivity is also the secret behind the powerful midget magnet already mentioned. Ordinary electromagnets would melt themselves to copper puddles if operated at full potential. Westinghouse's

(Continued to page 226)



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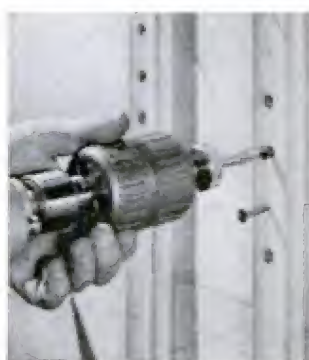


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If it all sounds far out, brace yourself. This is only the crude beginning of a new era in electronic magic. Under the broad heading of *solid state*, a vast array of even more systems and devices are already with us and working (see p. 88).

### Playing-Card Computers

Tiny thermoelectric devices utilizing the same n and p regions that make a diode work, are converting heat directly into electricity. Similarly, photoelectric materials are producing electricity from a light source shining on them, and amplifying light much the way a transistor amplifies electricity. Microscopic electroluminescent phosphors that glow when triggered by an electric current are producing light in wafer-thin sheets of glass and plastic, with scores of uses in home illumination as well as in display panels such as flat TV tubes.

The world of solid state, as one physicist puts it, "will be like a building-supply yard. You'll have many materials that can be combined in different ways to build different structures for different purposes. Two or three tiny pieces, linked together, for instance, will one day make you a combination radio-wristwatch. By adding thermoelectric grids to electroluminescent materials, walls and ceilings will heat and cool homes as well as light them."

Out of it all should come—if the usually conservative researchers are right—a treasure chest of conveniences and marvels the likes of which man has never known. Even the simplest devices haven't begun to hit their useful potential in small practical ways. "Diodes," points out GE's R. W. Solinger, "will one day be used to make fool-proof automobile distributor units that will last the life of the car. They will replace short-lived starters in fluorescent bulbs. Silicon-controlled rectifiers (supertransistors) will provide dimming instead of switching for your home lighting — with photoelectric sensor devices controlling the whole business automatically, depending on the brightness outdoors.

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(Continued to page 228)

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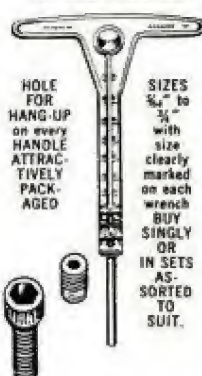


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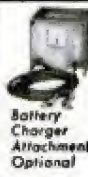


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to the electric car. There will soon be an electronic caddy. You'll call your golf clubs to you, and they'll come."

The means for all this is available now. All that needs to happen is for industry to pick it up and use it. And the possibilities are endless. "An interesting thing," says Fred Hedding of Westinghouse, "would be to tie in nine-volt thermoelectric power with tunnel diodes. You could come up with a thermoelectric fire alarm in which heat would set off the thermoelectric generator, which would generate current to trigger the tunnel diode that would blow a horn."

### **Air-Conditioned Suits**

Hedding, an expert in thermoelectrics, sees an endless field. "Refrigerators in space capsules will have to be thermoelectric," he says. "But we can also use them to advantage in aircraft. The basic machinery for a refrigerator in a transport plane would consist of a solid chunk of material one third of a cubic inch in total area, using thermocouples the size of grass seeds to start it and stop it automatically. We already have a back-pack propane furnace that makes its own electricity to power the blower to push hot air through a thermoelectric suit, or suck out heat and blow cool air through it. The day will come when we'll have air conditioned suits for everyday wear. They would keep you comfortable from -40 to +100 degrees F. A home furnace the size of an oil drum, using propane, wood, oil or natural gas fuel, will someday provide its own electricity to run its blowers, and switch itself on and off."

Probably most amazing of all solid state's new tools today is the maser—producer of the fantastic beam mentioned earlier. The letters stand for Microwave Amplification by Stimulated Emission of Radiation, and this incredible device is stirring up more interest among physicists than the transistor did 10 years ago.

### **Death Ray**

Masers take radio waves or light waves (in which case they're called optical masers or lasers), boost them hundreds of times, then shoot them off in a powerful concentrated beam. The light they generate within the cone is more than a million times brighter than the sun. It is also hot enough to burn a hole through everything from razor blades to people. It could be, in fact, a genuine death ray. Portable versions of it already have been built.

The beam's cone angle is so narrow that some lasers, operating through a telescope from Earth, could send a shaft of light to the moon that would illuminate a spot less than a mile in diameter.

The device is remarkably simple. One type consists of a small ruby rod, anywhere from one to four inches long, with a spiral flash lamp coiled around it. Another is a glass tube filled with neon and helium. When activated by a flash of light, high energy atoms inside these gadgets are excited by the stimulus and boost the light waves as they bounce back and forth between mirrored ends of the crystal or tube. Suddenly the wave charge achieves an energy level that shoots it through the mirror on one end. And away goes the beam—in a coherent shaft of light emitted in pulses about a millionth of a second apart. This means the beam can be modulated like radio waves—something never before possible with light's incoherent scatter.

### **100 Million Calls**

Because of the beam's fantastically high frequency, scientists envision giant strides in the field of communications. Contained in a sort of wave-guide tunnel with mirrors to bounce it around bends, a single maser beam could carry 100 million telephone calls simultaneously. Present ocean cables carry 100 at a time. Similarly, more than a million TV channels could be carried by it simultaneously. It can also transmit light in the green frequencies for several miles under water—which hints at possibilities for submarine communications.

Due to the maser's sharply defined focus (it can be squeezed through a hole 50-millionths-of-an-inch in diameter) medical experiments on rabbits are being tried at Technical Research Group on Long Island, N. Y. One bunny had a tumor on the retina removed by laser. The narrow beam aimed at the eye was further reduced by the eye lens itself, and hit a pinpoint of retina for a thousandth of a second—enough to do the job without inflicting damage.

For a long while, masers were stymied because they could only work in short bursts. But a few months ago Bell Laboratories announced a continuous beam had been achieved, and experiments are running high again.

At the Naval Research labs, masers hooked to radio telescopes have already been used to measure energy waves from the surface of Jupiter, establishing the temperature there at 150 degrees below zero F. A maser radar using a four-inch antenna can do a sharper job than ordinary microwave radar with a 60-foot basket. Already it is being talked about as a tool for mapping the moon and planets with pinpoint accuracy. If it does, and it probably will, masers will qualify as the farthest out of all the way-out solid state devices. ★ ★ ★



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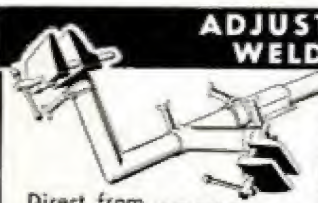
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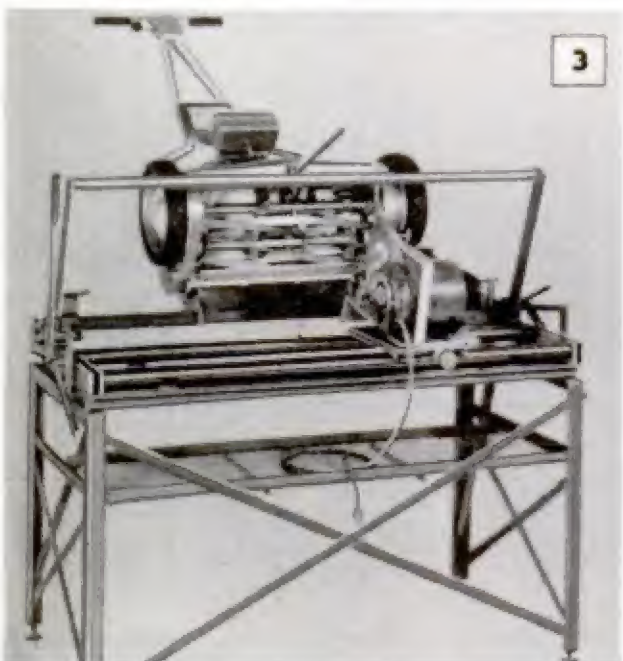
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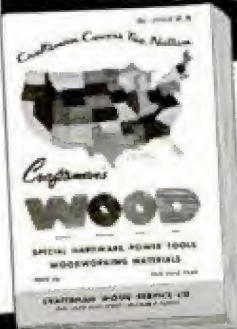
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## Serviceman Looks at the '62's

(Continued from page 103)

Meanwhile, chassis engineers have gradually reduced the number of points requiring regular lubrication by using rubber, sintered metal containing graphite, and plastics of the nylon type for bushings and other wearing surfaces.

Despite this progress, two areas still presented serious lubrication problems. None of these materials seemed suitable for the heavily loaded front-suspension ball joints. Tie-rod ends and other joints in the steering linkage also required frequent greasing to prevent excessive steering effort.

The breakthrough came with the development of "moly" grease and seals of improved synthetic rubber. When a chassis lubricant is enriched by approximately three percent of molybdenum disulfide, it not only does a better lubrication job but also provides greatly increased resistance to being squeezed or washed out of the bearing or joint. "Moly" particles have a molecular structure in which a layer of molybdenum atoms is sandwiched between layers of sulfur atoms.

The bond between these dissimilar materials is strong, but the bond between adjoining layers of sulfur atoms is weak. Sulfur atoms, however, attach themselves firmly to metal. As a result, "moly" grease clings tenaciously to metal surfaces, while slippage between layers of sulfur atoms cuts friction to a minimum.

### Seals Hold Up

Cadillac and Ford introduced sealed suspension and steering joints packed with "moly" grease in 1961 models. Dealer service managers report surprisingly little trouble. In normal use, sealed joints should stand up for 30,000 miles or more without developing squeaks or excessive wear, if the seals are not damaged.

Police cars, taxicabs and other vehicles operating around the clock in all kinds of weather present the biggest challenge to factory-sealed lube points. So far, most fleets of this type have been more than a little cautious.

One of a group of 1961 Fords patrolling the parkways surrounding a large eastern city was allowed to run 30,000 miles before the front ball joints were pulled for inspection while the rest of the cars in the fleet were lubricated every 10,000 miles with "moly" grease. Despite the fact that joints of the "guinea-pig" car were still in good condition, the 10,000-mile lubrication interval was continued and subsequent orders

(Continued to page 234)



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JANUARY 1962



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for new cars specified that they must be equipped with lube fittings. One police shop foreman commented, "I think a car deserves a grease job after 10,000 miles."

New York City's big cab fleets also order their Fords equipped with grease fittings and insist on regular chassis lubrication.

Significantly, those who don't go along with the idea of long-term chassis lubrication seldom question the durability of the sealed joints. They are more concerned over the danger of unseen little troubles developing into big ones.

As Chevrolet's Ed Cole puts it, "We think somebody ought to get under a car and look for trouble every thousand miles or so." Experienced auto repairmen agree that twice-a-year checks just aren't frequent enough to detect such potentially serious troubles as loose or worn steering linkage, leaking mufflers or leaking oil and grease seals. The sealed joints themselves should be inspected whenever the car is on a lift. If there is evidence of leakage, the joint should be repacked with the proper lubricant and a new seal installed.

Manufacturers who have eliminated the need for frequent chassis lube jobs have keyed inspection and minor service to oil-change periods. Conflicting recommendations as to when used oil should be drained have probably created more confusion in the mind of the average car owner than any other aspect of service. Oil companies, through the American Petroleum Institute, recommend drain periods of every 60 days in warm weather, every 30 days during the winter, with maximum mileage not to exceed 2000.

Auto companies specify drain intervals ranging from 2500 to 6000 miles under normal driving conditions. In most cases, more frequent changes are recommended when the car is operated in dusty areas or in short-trip service during cold weather.

Ford hangs its 6000-mile oil change on the stipulation that only MS oils which have passed a sequence of severe tests developed by auto makers and oil companies are suitable. Such oils can be identified by a certification to this effect on the can.

### Old-Maid Test

Supporting Ford's views are results of an "Old-Maid" test given four Lincolns. For seven months, the cars were driven under low-speed, light-load conditions involving frequent starts and stops. After periods ranging from 15 minutes to an hour, they were sent back to the cold room to chill the engine oil, then back on the test track to repeat the cycle.

(Continued to page 236)



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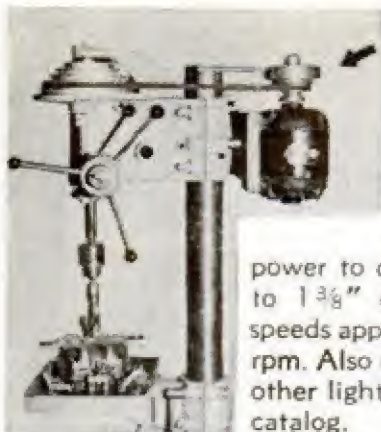


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SOME DEALER TERRITORIES AVAILABLE

When the test was concluded, the car which used regular SAE 20 oil had heavy accumulations of sludge in the oil pan, oil pump pickup screen and other locations. Engines of the other cars, using three different brands of certified MS oils, were almost as clean as new.

Still another appeal to the new-car buyer's pocketbook is the two-year, or 30,000-mile, coolant offered by American Motors and Ford. The cooling system is filled at the factory with an ethylene-glycol-base antifreeze containing inhibitors said to provide protection against corrosion for the specified period. Prolonged testing has shown that these coolants will do the job, as long as the system functions normally.

What can happen to upset the applecart? For one thing, there's always the possibility of leakage. Every time water is added, the solution is diluted, decreasing protection against freezing and corrosion. Secondly, an air leak may admit enough oxygen to neutralize inhibitors and cause rust.

Finally, exhaust leakage into the cooling system, due to a faulty head gasket, forms acids which deplete inhibitors. *These aren't sealed cooling systems.* They should be inspected regularly and serviced promptly if leakage or corrosion develop.

Use of a glycol mixture in hot weather introduces another problem. Since it cannot transfer heat as rapidly as water does, the engine may run slightly hotter, in some engines, hot enough to raise octane requirement as much as four numbers.

The motorist who must switch from regular fuel to premium will spend more money on higher antiknock quality than he'll save on antifreeze.

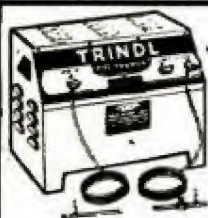
Except for lubrication and tuneup, brake adjustment is the most common service operation. Self-adjusting brakes, now offered on many cars, employ a simple cable-and-pawl arrangement to take up excessive clearance when the brakes are applied as the car backs up. But some conservative, low-mileage drivers never apply the brakes hard enough in reverse to actuate the self-adjusting mechanism. Eventually, something sticks, necessitating a manual adjustment.

The car owner who doesn't want to automatically adjust his brakes clear through the lining should have a wheel pulled and linings inspected after the first 10,000 or 12,000 miles and every 4000 to 5000 miles thereafter.

Maintaining the new cars isn't the chore it once was, but the sealed chassis and engine which will go 100,000 miles without service is still in the future. ★ ★ ★

POPULAR MECHANICS





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## An Engineer Analyzes the '62s

(Continued from page 113)

come to a screeching halt. Now we're turning back to simplicity, low cost, lighter weight. The "ideal" automatic transmission—which lets the engine pump at a more or less constant high r.p.m. as the car accelerates, but keeps it at a very low r.p.m. for cruising—has been shelved for the time being. *Economy* is the watchword now and theoretically-ideal designs are much too expensive.

Proof positive that the worm has turned in U.S. automatic transmission design is the fact that Chevrolet dropped its triple-turbine Turboglide on the '62 models, after producing it only four years.

Buick dropped its similar Flight-Pitch Dynaflow in 1960, after only two years of production. Both designs approached closer to the ideal than any other known transmission. But they were just too big, too heavy, too expensive, too complicated.

### Lighter Transmissions

So it was no surprise to find Chrysler engineers playing it cool when they redesigned their Torqueflite 3-speed torque converter for their '62 V8s. Operating principles, gear ratios, converter layout, etc. are all the same as before. But everything has been trimmed down. The internals have been squeezed into a smaller housing so the floor hump is greatly reduced; there are fewer parts (to reduce costs) and a new aluminum case has cut 60 pounds from the weight.

Chevrolet has put a new aluminum case around the 2-speed Powerglide and saved 85 lb. Actually this swing to aluminum parts on transmissions (and many other components) is not just to save weight.

The soft, low-melting-point metal is actually cheaper and quicker to cast and machine in many applications, even though it costs three to four times as much per pound as cast iron.

American Motors' new "E-Stick" arrangement on the American line is a clever approach to a "poor man's automatic." Essentially it's just an automatic clutch in conjunction with a conventional manual-shift 3-speed gearbox. A servo mechanism utilizing engine oil pressure and manifold vacuum will engage the clutch whenever the engine speed rises above a certain r.p.m. There's no clutch pedal at all. With the engine idling you can shift into any gear.

Then when you press the throttle and as the engine speeds up, oil from the engine's lubrication pump forces the clutch to engage and the car moves away. To

shift you just lift your foot from the accelerator, touch the lever and the clutch automatically disengages as oil is "dumped" from servo cylinder, and the gear lever can be moved to the next gear. The optional price of \$60 is only about one-third the cost of the average automatic transmission.

If you had predicted five years ago that we would soon be able to order optional floor-shift 4-speed transmissions on eight different makes of American passenger cars—well, you'd have been laughed at. Why should a big high-torque U.S. engine need four, close gear ratios? That's for tiny, 40-horsepower foreign cars. Big American cars could get along nicely with two gears forward.

Actually it's not a matter of need. It's what a lot of buyers *want*. It's fun to drive. The short, positive floor shift lever makes shifting a pleasure and the more speeds the better! And it *has* been proved that the four close ratios help acceleration up to 80-100 m.p.h. on the drag strip, because the engine r.p.m. doesn't drop back so much when you shift. Detroit is selling thousands of these things at optional prices up to more than \$300, to the sporty-type buyers of Chevrolets, Pontiacs, Fords, Larks, Hawks, Tempests, Corvairs, and Buick Specials.

Borg-Warner gear engineers did some very clever "cobbling" to make it all possible. Back in 1956, when Chevrolet was starting to push the Corvette as a high-performance sports-racing car, B-W was presented with the problem of bringing out a close-ratio 4-speed at minimum cost.

What they finally did was to take their heavy-duty 3-speed, move the reverse gears back into the tailstock housing, make up a new gearset with four ratios for the main gearcase, and put a neat floor shifting linkage alongside!

And one other interesting "transmission" trend: The limited-slip differential continues to gain popularity. They're now invading the compact field. The new '62 Buick Specials, Olds F-85s, and Chevy II offer the feature. Cadillac has a new design. Most U.S. cars can now be ordered with this useful feature for around \$40.

### CHASSIS

American passenger car chassis design may be following the same trend as automatic transmissions—they seem to be getting *simpler* and less costly instead of more complicated.

The most important new chassis development this year—Chevy's single-leaf rear spring—is aimed at trimming, saving, simplifying. Auto engineers have wanted to

(Continued to page 240)





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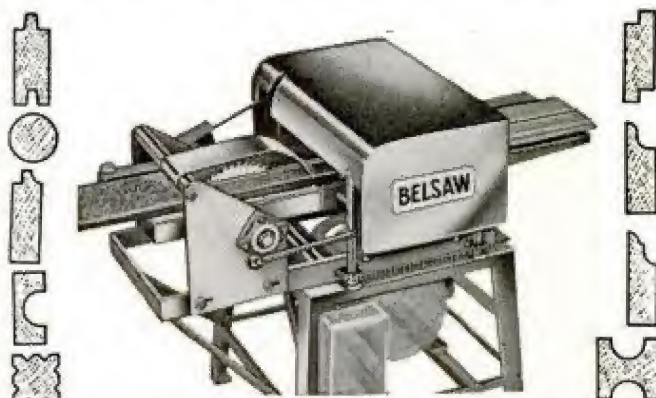
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use single-leaf springs for 30 years. With more than one leaf you can't stress the material evenly over the whole length of the spring, so you need more pounds of steel to do the job. Also there is a certain amount of friction between the leaves of a spring as it flexes going over bumps. This "interleaf" friction has the effect of "locking" the leaves together preventing flex, especially on very small bumps and tar strips. The single-leaf spring is the ideal way to do the job. It's smoother and lighter.

But there were problems. In order to get even stressing along the length (so the minimum amount of material is required) the leaf must be thicker in the center than at the ends. This makes a tricky production job; it stumped engineers for 30 years. Now Chevrolet has found a way to roll the leaf so that it spread out *wider* at the ends where it is squeezed down *thinner*! Another trick is a new machine that automatically shot-peens the springs while they are compressed under a normal load. This allows higher working stresses, so we get that much more work out of each pound of steel.

Finally, Chevrolet mounts the single-leaf spring to the rear axle and body in a new way. The spring is not clamped solid in the center (to the axle) as is usual. It rides in thick rubber pads in the center

and on big, fat rubber bushings at the ends, so it is completely isolated from the body. This not only eliminates any "dead" area at the clamping point but the rubber insulation also reduces road rumble and vibration.

The trend to the high-mounted front coil springs is continuing. The new Chevy II and Ford Fairlane both use the layout. Normally the front coil springs are placed between the two suspension arms (wishbones). This exerts very high stresses in this area due to the concentration of forces. The new "unit," or box-type, bodies (no separate frame) aren't happy with these stress concentrations. By mounting the coil spring above the arms, seating it in the upper fender well, designers spread these forces out, and ease the load on the front body structure.

Unit body design seems to go in different directions. Chrysler started out in 1960 by bolting on their front body superstructure, then changed to welding it on this year's Dodge, Plymouth. But, on the new Chevy II, unit body is bolted to front structure and fenders. Each method has its advantages. Welding is probably cheaper; but you can rebuild a front end after a crash a lot cheaper if you can unbolt the old stuff and bolt on new panels. Which gives the

(Continued to page 242)

POPULAR MECHANICS



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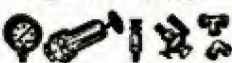
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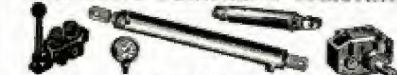
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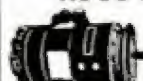
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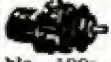
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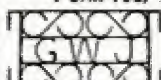
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stronger, quieter, stiffer body is debatable.

A few other suspension developments: Lincoln is using huge 1 5/8-inch pistons in their shock absorbers to further reduce fluid pressures and get smoother, more consistent action. They're using a short cantilever leaf spring to support the transmission on the new Falcons and Comets, to isolate engine vibration and road rumble from the body. The Buick Special features variable-pitch rear coil springs to get a smooth ride with a progressive stiffening of the spring on hard bumps.

We find more and more sound insulation on late unit bodies. (Unit bodies tend to act like a big bass drum to amplify road rumble, so sound insulation is very critical.) Engineers found that a few pounds of sprayed-on asphalt deadener, jute padding and fiberglas blanketing properly distributed around the inside of the body panels were quite effective on controlling rumble. But the more they add the quieter the body seems to get. They went hog wild on some models this year. The only practical limit seems to be how much weight you're willing to add and how much money you're willing to spend to quiet the body!

**Fort Snow**, a modern castle for eager young snowballers, can be built using the February PM plans for a simple snow block casting machine.

Most interesting brake development this year is the dual-master-cylinder layout on Cadillacs and Ramblers. It's largely a safety feature. The brake pedal operates two master pistons in tandem, one feeding the front brakes and the other the rears. They are two separate circuits.

If a brake line should break at either end of the car the other circuit would continue to provide effective braking. On a conventional layout a broken line anywhere would wipe out the whole system. Detroit is thinking about safety.

We also see more self-adjusting brakes on '62 models. This feature should sweep the industry in another two years. A ratchet arrangement on the brake shoes automatically takes up slack whenever the car backs up. Only costs a few pennies, and brakes should never need adjusting. Credit Ford with this development. Another Ford Motor Co. improvement this year is use of aluminum-drum front brakes on Lincolns, for better cooling under rough conditions with this relatively-heavy model. Lincoln doesn't have the cost problems of our big-volume cars, but this *might* just be the start of a trend. ★ ★ ★



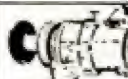
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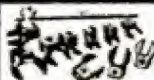
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**ELECTRIC STORAGE BATTERY WINCH** New, improved model contains heavy-duty, 2-way drum switch. Fully reversible heavy-duty, two-speed motor, 160 to 1 gear reduction. Ball bearing construction throughout. Drum will handle 70' of 1/4" cable. Can be used on 6, 12, 24 V. battery. Lift cap. 2000 lbs. plus. Ready to install & operate. 19" long x 9" wide x 8" high. For jeeps, trailers, boats, trucks, etc. Complete with mounting flange, safety load locking brake and leads. Shpg. Wt. 60 lbs. Approx. GOVT. COST \$400. NEW, Model E. \$49.50.



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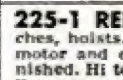
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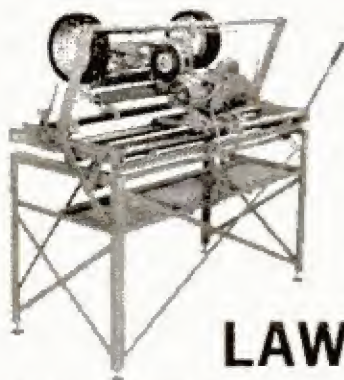


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## Ford, Plymouth, Chevy II

(Continued from page 108)

cylinder engine, we found that it was much smoother below 40 m.p.h. than the Chevy II Four was. The Tempest was tolerant down to 15-18 m.p.h. in high, down to 8 or 10 in second gear when lightly loaded and driven on level city pavement.

The four-cylinder Chevy II accelerates reasonably well from 55 to 75, and holds the road at 65 without much vibration. It could obviously do 85 flat out.

Chevy IIs ride is a little bit "busier" than the Fairlane's. There is a bit more jar felt through the Chevy II's suspension, but it is a muffled jar.

When you concentrate on the ride, you come to the conclusion that the car is a bit smaller and a bit lighter. Ride of the six-cylinder Deluxe-Chevy II was better in this respect, just about on a par with the Fairlane Six. Chevy II's new, single-leaf rear springs are definitely a plus. They give smooth, supple action on big bumps with satisfactory smothering of surface harshness. No real complaint with the ride . . . it's just a bit firmer than average.

There is a feeling that the car is just a little smaller than the Fairlane and you feel that the hood shows a bit less in front of you and that it seems to be shorter and drops off a little bit more, allowing you to see more in front. The windshields of the Chevy II and the Fairlane are almost the same.

### FORD FAIRLANE

There's adequate legroom for a driver of 6'2" height in the Fairlane, with no back discomfort on a 48-mile run. But the tall driver's right leg tends to feel cramped in a Fairlane in traffic.

The car has a pretty good response for a small engine in a 2800-lb. car carrying only a 200-lb. driver.

There's better than average lack of wind noise around the car at 70 m.p.h. with all the windows buttoned up. There was a good deal of exhaust resonance and engine and transmission noise through the rubber carpet. On the V8 Deluxe Fairlane, tested earlier, there was little of this. Acceleration and pickup are satisfactory on the Fairlane; it performed well, had a good ride, but sound and vibration level was annoying. It was the standard model. There seemed to be more difference between the luxury of the Fairlane 500 and the standard trim Fairlane than between the Deluxe and Standard of Chevy II.

Steering on the Fairlane is light and responsive. It's doubtful that anyone would consider the need for power steering on the Six with manual transmission. The V8,



weighing 75 lb. more, might be marginal. Ford's recirculating ball gear does the job well.

Vision is good in the Fairlane and the rear-view mirror at the top of the windshield doesn't get in the way. Side pillars are adequately thin but the left hand pillar angles so that it blocks too much vision. The hood is flat and not too long, but is fairly high. In spite of this, there's pretty good view over it.

Instruments are a step in the right direction—three hooded dials with fairly dull paint. Center portion of the dials are shiny concentric circles on aluminum discs which feed back a reflection.

In conclusion we feel that Plymouth's Belvedere Six with automatic transmission is a very pleasant transportation package costing little more to run than Chevy II, a true compact.

If you appreciate the extra maneuverability of a car 19 inches shorter than the Plymouth (and some \$200 less in cost), Chevy II would be your choice, although

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you'd probably like it better with six cylinders. Ford's Fairlane is roomy and solid, but the stick shift Six doesn't offer much greater performance or smoothness and silence than Chevy II or it's own compact little brother Falcon. ★ ★ ★



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